Poster Corners
Glucose and glucose control: 0453–0466

0453

MOVING AWAY FROM TIGHT GLUCOSE CONTROL. WHAT IS THE IMPACT ON PATIENTS IN A DISTRICT GENERAL HOSPITAL INTENSIVE CARE UNIT?

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INTRODUCTION. The question of optimum serum glucose levels in the critically ill, and the effect on outcome continues to be keenly debated. A recent large trial has shown that intensive glucose control increased ICU mortality among adults in ICU [1].

OBJECTIVES. To compare two protocols with different triggers for starting insulin sliding scales for glucose control, in a district general hospital ICU in the UK and to observe the effects on our patient outcomes.

METHODS. In May 2007 our ICU protocol trigger for starting insulin sliding scales for glucose control changed from glucose level greater than 8 mmol/l (group 1) to 10 mmol/l (group 2). No other policies were changed during this period. We compared 208 patients in group 1 to 659 patients in group 2. Only patients on an insulin sliding scale were included. A severe hypoglycaemic patient day was defined as a day in which a patient had at least one blood glucose reading <2.1 mmol/l.

RESULTS. In Group 1, 39.9% of patients were female versus 42.9% in group 2 ($p = 0.47$). In group 1 and group 2, 15.4 versus 20.8% were admitted from A&E, 52.9 versus 50.1% admitted from theatre and 31.7 versus 29.1% admitted from other locations, respectively ($p = 0.23$). The mean age was 67 versus 64 years ($p = 0.02$) in group 1 and group 2, respectively.
There was no significant difference between the two groups regarding all cause mortality within 28 days ($p = 0.44$), 90 day mortality ($p = 0.20$), ICU mortality ($p = 0.16$) or length of stay in ICU (0.21). There was no significant difference in the number of severe hypoglycaemic patient days ($p = 0.86$) or in the number of patients having severe hypoglycaemic days ($p = 1.00$).
The ICU and hospital mortality ($p = 0.00$) was significantly greater in the group of patients who had severe hypoglycaemic patient days.
The odds ratio for a patient who had a severe hypoglycaemic patient day dying in hospital was 8.978 (95% CI 3.640–22.145) and for dying in ICU was 14.728 (95%CI 6.622–32.760) greater than those for those who did not. The relative risk of those who did not have a severe hypoglycaemic patient day dying in ICU and hospital was 80 and 61% less, respectively, than in those with severe hypoglycaemic patient days.

CONCLUSIONS. Changing our policy on glucose control from a treatment trigger of >8 to >10 mmol/l had no significant difference on the incidence of severe hypoglycaemic patient days or ICU mortality but the group of patients with severe hypoglycaemic patient days had higher mortality.

REFERENCE. 1. The NICE-SUGAR Study Investigators (2009) Intensive versus conventional glucose control in critically ill patients. N Engl J Med 360(13):1283–1297.

0454

ENHANCED MODEL PREDICTIVE CONTROL (EMPC) ALGORITHM IS A SAFE AND RELIABLE TOOL FOR THE ESTABLISHMENT OF GLYCAEMIC CONTROL IN SERIOUSLY ILL MEDICAL ICU PATIENTS—RESULTS OF ALDEA 01

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INTRODUCTION. Several trials investigating the effects of tight glycaemic control failed to establish glycaemia within the target range. In contrast, the eMPC algorithm has demonstrated to be effective and safe in critically ill medical and surgical patients for a period of up to 5 days.

OBJECTIVES. To investigate the performance of the eMPC algorithm for glycaemic control in mechanically ventilated medical ICU patients for the whole length of stay. The primary endpoint was defined as time within target range (80–110 mg/dl).

METHODS. Patients with an expected ICU stay >5 days were recruited in this single-centre, open, non-controlled trial. 44 nurses were trained to run a laptop-based bedside version of the eMPC.

RESULTS. 20 patients (age 69 ± 11, BMI 27.4 ± 4.5, APACHE II 25.5 ± 5.2, 16 male, 6 diabetic) were included for a period of 7.8 ± 4.1 days. The percentage of time spent within predefined glucose level ranges is displayed in Table 1. Mean arterial blood glucose was 105.7 ± 8.9 mg/dl. Three single hypoglycaemic episodes occurred during the trial, corresponding to a rate of 0.018 per treatment day. No malfunctions of the eMPC algorithm were observed.

TABLE 1 PERCENTAGE OF TIME WITHIN GLUCOSE RANGES

Blood glucose (BG) range	<40 mg/dl	40–60 mg/dl	60–80 mg/dl	80–110 mg/dl (target range)	110–150 mg/dl	>150 mg/dl
Time in BG range (%), mean ± SD	0.02 ± 0.08	0.79 ± 0.66	11.39 ± 3.50	58.12 ± 10.05	23.09 ± 7.00	6.59 ± 7.15

CONCLUSIONS. From a clinical point of view, performance of the eMPC algorithm was excellent. The eMPC algorithm is a safe and reliable method to control blood glucose in critically ill patients in the medical ICU.

GRANT ACKNOWLEDGEMENT. The study was sponsored by BBraun, Melsungen, Germany.

0455

LOW INCIDENCE OF HYPOGLYCAEMIA WITH COMPUTER-ASSISTED GLUCOSE CONTROL IN INTENSIVE CARE PATIENTS

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INTRODUCTION. Insulin administration is associated with the risk of iatrogenic hypoglycaemia. To improve patient safety and optimize glucose control (GC) we implemented a nurse-driven computerized glucose regulation program in our intensive care unit (ICU) [1].

OBJECTIVES. To evaluate the safety and efficiency of computerized GC after being part of routine workflow for over 4 years.

METHODS. In this observational cohort study we collected data of consecutive patients admitted in our mixed ICU (45 beds) of a university teaching hospital. All patients were glucose regulated with a computer-assisted glucose regulation protocol called Glucose Regulation for Intensive care Patients (GRIP). Effectiveness was determined in terms of achieved glucose control and incidence of hypoglycaemia, which we compared with other published computerized glucose regulation programs.

RESULTS. We analyzed 162,884 BG samples of 5,898 consecutive ICU patients (55% surgical). Mean ± SD age was 60 ± 16 and 3,771 patients (64%) were male. Of all measurements, 0.5% were below 3.5 mmol/L (mild hypoglycaemia) and 0.05% below 2.2 mmol/L (severe hypoglycaemia). 58 patients (1.0%) experienced at least one episode of severe hypoglycaemia during their entire length of stay at the ICU. Of the severe hypoglycaemic episodes, 55% was iatrogenic. The remaining episodes occurred after withdrawal of medical treatment or severe hypoglycaemia was a reason of ICU admission. Mortality was 8.3% (ICU) and 11.5% (hospital). Glucose control with the computer-assisted GRIP program was efficient with glucose values within the predefined target range (4.0–7.5 mmol/L) in 75% of the time. The mean number of blood glucose measurements was 5.6 per patient per day.

CONCLUSION. In a large cohort covering all sorts of ICU patients, glucose control was efficient with a low number of hypoglycaemic episodes. In comparison with other published computerized protocols, this was achieved with considerably less blood glucose measurements.

REFERENCE. 1. Vogelzang M, Loef BG, Regtien JG (2008) Computer-assisted glucose control in critically ill patients. Intensive Care Med 34:1421–1427.

0456

THE PROGNOSTIC VALUE OF ADMISSION BLOOD GLUCOSE LEVELS

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INTRODUCTION. Admission blood glucose levels are known to have a prognostic value in ICU patients. We wondered whether the addition of blood glucose to severity indexes may increase their prognostic value.

OBJECTIVE. To study the relation between admission blood glucose levels and morbidity and mortality in critically ill patients.

METHODS. We reviewed all 420 adult patients (stayed >1 day) consecutively admitted to our 35 bed medico surgical Intensive Care Department over a 3-month period. After exclusion of four patients who had severe hypoglycemia (less than 60 mg/dl), admission blood glucose levels were classified in four groups: Group A, less than 110 mg/dl. Group B, between 110 and 149 mg/dl. Group C, between 150 and 180 mg/dl. Group D, greater than180 mg/dl.

RESULTS. Patients in group B had lower APACHE II, admission and Maximum SOFA scores than group D ($P < 0.01$). They also had a shorter length of stay (LOS) than group D ($P < 0.05$). Mortality rate was lower in group B than C and D [Table 1 (mean ± SD)]. Compared to group B, risk of mortality increased to four times in group C and D [OR 3.96 (CI 95% 1.71–9.20) and OR 4.17 (CI 95% 1.87–9.29), both $p < 0.01$]. A receiver-operating characteristic (ROC) curve to predict mortality showed that increasing admission blood glucose levels were associated with increasing mortality (AUC 0.64, CI 95% 0.56–0.72, $P < 0.01$) but the AUC was smaller than for APACHE II (AUC 0.84, CI 95% 0.79–0.89, $P < 0.001$), admission SOFA (AUC 0.83, CI 95% 0.78–0.89, $P < 0.001$) and maximum SOFA (AUC 0.88, CI 95% 0.83–0.93, $P < 0.001$) scores. Adding admission glucose levels to either APACHE II or admission SOFA scores AUC models did not add any significant information to their predictive values on mortality (AUC 0.85, CI 95% 0.80–0.90 and AUC 0.85, CI 95% 0.79–0.90,*both* $P < 0.001$).

TABLE 1

	Group A, glucose <110 mg/dl, *n* 57	Group B, glucose 110–149 mg/dl, *n* 146	Group C, glucose 150–180 mg/dl, *n* 92	Group D, glucose >180 mg/dl, *n* 121
Age (years)	57 ± 20*	58 ± 18*	61 ± 17	64 ± 15
Sex, M/F (*n*)	35/22	96/50	61/31	66/55
Medical/surgical (*n*)	25/32	65/81	36/56	53/68
APACHEII score	10.7 ± 7.5	9.8 ± 5.3**	12.0 ± 6.1	13.2 ± 6.0
Admission SOFA score	3.9 ± 4.1	3.6 ± 2.5**	4.3 ± 2.7	5.1 ± 3.1
Maximum SOFA score	4.5 ± 4.1*	4.3 ± 3.1**	5.2 ± 3.5	6.1 ± 4.1
LOS (days)	3.4 ± 6.1	3.1 ± 4.0*	3.3 ± 5.7	5.4 ± 9.2
Mortality,*n* (%)	7/57 (12)	9/146(6)‡‡**	19/92 (21)	26/121(21)

* $p < 0.05$, ** $p < 0.01$ versus group D. ‡‡ $p < 0.01$ versus group C

CONCLUSION. Admission blood glucose levels between 110 and 149 mg/dl is associated with better outcome, less morbidity severity scores, and shorter length of stay. Adding blood glucose values to severity scores do not add to their predictive value.

0457

TIGHT GLYCEMIC CONTROL: A SYSTEMATIC REVIEW ON THE REASON FOR SUCCESS OR FAILURE

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INTRODUCTION. Following publication of the "Leuven Intensive Insulin Therapy Trial" [1] in 2001, tight glycemic control became the standard of care in ICU's. The recent NICE-SUGAR [2] study and others suggest that this approach may be flawed.

OBJECTIVES. The goal of this systematic review was to determine the benefits and risks of tight glycemic control in ICU patients and to explain the differences in outcomes between reported trials.

METHODS. Prospective, randomized, controlled clinical trials (RCT's) that studied the impact of tight glycemic control (blood glucose 80–110 mg/dl) on mortality in ICU patients were searched in MEDLINE, Embase, the Cochrane Database of Systematic Reviews and citation review of relevant primary and review articles. Data were abstracted on study design, study size, patient characteristics as well as mean blood glucose level, mean daily dose of insulin administered, average daily caloric intake, use of parenteral nutrition, incidence of hypoglycemia, need for dialysis and 28 day/hospital mortality. Meta-analytic techniques were used to analyze the data; meta-regression was used to explain difference in the treatment effect.

RESULTS. We identified 7 RCT's studies that included 11,425 patients. Overall, tight glycemic control did not reduce the 28 day mortality (OR 0.95; 95% CI 0.87–1.05), the incidence of blood stream infections (OR 1.04; 95% CI 0.93–1.17) nor the requirement for renal replacement therapy (OR 1.01; 95% CI 0.89–1.13). The incidence of hypoglycemia was significantly higher in patients randomized to tight glycemic control (OR 7.7; 95% CI 6.0–9.9, $p < 0.001$). Meta-regression demonstrated a significant relationship between the treatment effect (28 day mortality) and the proportion of calories provided parenterally ($p = 0.005$). The difference in outcome between the two "Leuven Intensive Insulin Therapy Trials" and the subsequent trials could be related to the use of parenteral nutrition.

CONCLUSIONS. There is no evidence to support the use of intensive insulin therapy in general medical-surgical ICU patients who are fed mostly enterally. Tight glycemic control is associated with a high incidence of hypoglycemia with an increased risk of death.

REFERENCES. 1. N Engl J Med 2001;345:1359.
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0458

ACCURACY OF CONTINUOUS GLUCOSE MEASUREMENTS DURING HYPOXEMIA IN CRITICALLY ILL PATIENTS

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INTRODUCTION. Control of hyperglycemia is proposed in the critically ill patient for decreasing morbidity and mortality. However, concerns about hypoglycemia mainly in the most severely ill patients have been raised. A new device utilizing an enhanced optical signal resulting from a temporary over-systolic occlusion produced by a finger-based pneumatic has become available. This study assessed for the first time the accuracy of this non-invasive continuous glucose monitoring in hypoxemic severely ill patients.

MATERIAL AND METHODS. A NBM-200 device (Orsense Ltd) was placed at the base of a finger in 9 patients (aged 27–74 years) with SpO_2 below 90%. Red/near infrared occlusion spectroscopy detected blood glucose. NBM measured continuously glucose for 2–10 h with reading every 15 min. These results were compared to blood gas machine (ABL 700, Radiometer, Copenhagen, Denmark). A prospective analysis based on an uniform model with personal paramagnetic adjustments was performed for 180 readings. A Clarke Error Grid analysis was performed.

RESULTS. Calibration phase lasted 2 h. No adverse effect was identified. SpO_2 varied from 90 to 60% The blood glucose ranged from 48 to 234 mg/dL. The resulting Median Relative Absolute Error was 10.8 mg/dL, and the Median Absolute Error was 9.1%. The Clarke error grid analysis showed that 93.3% of the measurements fell within zones A (73.9%) and B (19.4%). The overall accuracy during hypoxemia was similar to nonhypoxemic periods. These results require larger studies.

CONCLUSION. NBM-200 seems to be a continual, accurate, safe and easy to use blood glucose evaluation in hypoxemic patients. This noninvasive method could improve the safety of patient care, and is promising in trend analysis and detection of hypoglycemia in the most at risk patients.

0459

GLUCOSE CONTROL IN RESPIRATORY ICU

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INTRODUCTION. Hyperglycemia is common among patients admitted to ICU. It is known that tight glucose control by insulin infusion may reduce mortality in this population but the optimal target for blood glucose range is unclear. Our objective was to assess the effectiveness of intensive insulin therapy among critically ill respiratory patients in achievement glucose control.

METHODS. Within 24 h after admission to the respiratory intensive care unit, patients were treated by insulin infusion for target glucose at 110–140 mg/dl. Patients treated less than 48 h were excluded. Patients with mean glucose >140 mg/dl throughout insulin therapy were classified as glycemic control failure (GCF). Mortality rate was compared among patients with/without GCF. To determine the impact of GCF on mortality, ICU survivors and non-survivors were compared using univariate analysis.

RESULTS. Total 89 patients were enrolled including 44 patients with COPD/Asthma exacerbation and/or Pneumonia, which were on mechanical ventilation ≥3 days and received predominantly enteral nutrition. Most of them were treated with corticosteroids. The main blood glucose was 138 mg/dl under insulin treatment. The glucose control failed in 22 patients (50%). Patients with/without GCF had similar characteristic at baseline. ICU mortality rate was 38.6% (17 patients). Hypoglycemia (23 episodes) was recorded in 14 patients (32%). All hypoglycemic episodes were resolved without significant adverse events. The mean number of glucose measurements was 8 per patient per day. The GCF group showed a tendency to higher mortality, but statistically it was not significant. Time to reach target glucose was longer in this group. Comparison between ICU survivors and non-survivors revealed that length of ICU stay, hypoglycemia rate, daily insulin dose and time for reaching target glucose had negative influence on mortality rate.

CONCLUSION. The glucose target achievement is difficult among critically ill respiratory patients despite intensive insulin therapy and above-normal target range. GCF has a tendency to higher mortality rate. To improve glucose control we should reduce the time for reaching target glucose and apply more accurate insulin dose adjustment to avoid hypoglycemia.

0460

THE IMPACT OF MEMBRANE LENGTH AND DIALYSIS PUMP VELOCITY ON ACCURACY DURING INTRAVENOUS MICRODIALYSIS

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BACKGROUND AND AIM. To achieve blood-sugar control, accurate on-line real-time measurements are desired. We have investigated the feasibility of intravenous microdialysis for this purpose. In earlier studies we have demonstrated that the intravascular membrane has an unaltered function for 3–5 days in critically ill subjects, but also that a minimum diameter of the vein with the membrane is needed. Here we elucidated the length of the membrane and the velocity of the microdialysis fluid pump in order to optimise the accuracy of measurements using healthy volunteers with blood-sugars in the normal range.

METHODS. In study I, 30 healthy volunteers were randomised to receive membranes of 10 or 20 mm length or to be controls. Plasma glucose concentration was used as standard. A study period of 60 min was used after a 60 min run-in period.

In study II, 15 healthy volunteers were studied using a 30 mm membrane, but with a microdialysis fluid pump velocity of 0.5, 1.0 or 2.0 μL/min in random order. Study periods of 60 min were used with run-in and wash-out periods of 60 min in between. Microdialysis samples were collected over six 10 min periods and plasma samples taken every tenth minute for comparison. Differences (delta) between microdialysis and plasma were calculated and median values for every sampling period (60 min) were compared using ANOVA.

RESULTS. The results are given as medians (quartiles) of the differences between plasma glucose concentration and microdialysis glucose concentration for the 60 min study periods, including six plasma values and six collection periods. In study I, the percentage differences were 22% (20–45), 7% (5–21), and 2% (0–4) for the 10, 20 mm and plasma controls, respectively. Comparisons showed that 20 mm and controls were different from 10 mm ($P < 0.0005$, Kruskal-Wallis). In study II the percentage differences were 5%(3–10), 23%(7–38) and 45%(10–58) for 0.5, 1.0 and 2.0 uL/min, respectively. Comparisons showed that 0.5 μL/min was different from 1.0 and 2.0 μL/min ($P < 0.00001$, Friedman).

CONCLUSION. It is concluded that in intravenous microdialysis a comparatively long membrane and a low velocity of the microdialysis fluid pump resulted in better concordance to plasma glucose concentrations.

0461

SUBCUTANEOUS INSULIN THERAPY REDUCES BLOOD GLUCOSE VARIABILITY IN THE CRITICALLY ILL PATIENT WITH ORAL INTAKE

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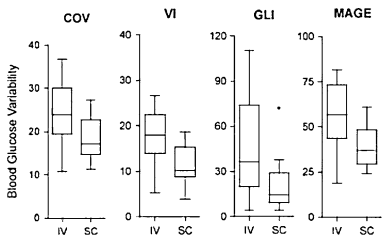
INTRODUCTION. High glycemic variability is an independent predictor of mortality in the critically ill [1]. Glycemic control decreases with transition from continuous parenteral or enteral nutrition to oral intake in patients on continuous insulin therapy. Insulin therapy may need to be modified with the onset of oral nutrition.

The objective of this study was to determine whether continuous intravenous insulin therapy, the current standard in ICU or intermitted subcutaneous insulin therapy allows a better glycemic control in ICU patients after initiation of oral intake.

METHODS. In this prospective, randomised study we included 30 ICU patients after initiation of oral intake, who had undergone elective cardiac surgery. 14 patients were administered IV insulin with an infusion pump and 16 patients SC insulin with a PEN. Blood glucose concentration was measured every 4 h and in addition before, 1 and 2 h after each meal.

The coefficient of variability (COV) [2], variability index (VI) [3], glycemic lability index (GLI) [4] and mean amplitude of glycemic excursions (MAGE) [4] were calculated to compare blood glucose variability between the groups.

RESULTS. Patients administered SC insulin had less variability of glucose concentrations in all calculations ($p < 0.05$)



Expressions of glucose variability

CONCLUSION. Oral intake of the critically ill should be combined with SC insulin therapy.

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0462

CHANGE OF STANDARD INFUSION FLUID FROM GLUCOSE INTO GLUCOSE/SALINE INCREASES HYPERNATREMIA WITHOUT IMPROVING GLUCOSE CONTROL

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INTRODUCTION. Both hypernatremia [1] and hyperglycemia are associated with increased mortality. In order to improve glucose regulation by reducing glucose load, we changed the basic infusion of glucose 5% into glucose 2.5%/saline 0.45%.

OBJECTIVE. Evaluate the effect of a protocol-change that was specifically intended to improve glucose control.

METHODS. In a 14-bed thoracic ICU, we prospectively analyzed two consecutive patient groups. All patients were managed with the glucose regulation for intensive care patients (GRIP)-computer system. Over the whole study period, GRIP aimed at the same glucose-target range of 4.0–7.5 mmol/L. The basic infusion in all patients consisted of 1,000 ml/day of isotonic glucose 5% (G-group) or 1,000 ml/day of isotonic glucose 2.5% with sodium chloride 0.45% (GS-group). This is equivalent to a net change in the daily administration of 25 g of glucose (100 kCal) into 4.5 g of NaCl. All additional infusions were either colloids of crystalloids that did not contain glucose, and were not changed. Blood glucose and sodium levels were recorded daily for up to the first 14 ICU-days. The incidence of mild hypernatremia (sodium >150 mmol/L) and pronounced hypernatremia (sodium/155 mmol/L) during the first 14 ICU days was also recorded.

RESULTS. The G-group consisted of 751 patients (25%) and the GS-group consisted of 2296 patients (75%). The overall impact on glucose control was limited. Initial mean glucose was 8.4 ± 1.6 mmol/L in the G-group and 8.2 ± 1.8 mmol/L in the G/S-group. Glucose levels on the first day post-surgery were 6.8 ± 0.9 and 6.9 ± 1.0, respectively. Also in the subsequent days glucose was not improved with in the G/S-group. The impact of the change in standard infusion on mean sodium levels during the first days was also limited: Initial sodium levels were 139 ± 3 and 139 ± 4 mmol, respectively. On the first day post-surgery these levels were 138 ± 3 and 139 ± 3 mmol/L for the G-group and GS-group. Later on this difference did not increase.
However, the incidence of mild hypernatremia was significantly lower in the G-group compared to the G/S group: 0.9 versus 1.9%; as was the incidence of pronounced hypernatremia 0.1 versus 0.6% ($P = 0.003$).

CONCLUSIONS. In the context of computer-guided glucose regulation substituting a modest amount of intravenous glucose with NaCl had no benefit on glucose regulation and hardly affected overall sodium levels.
However, the incidence of mild and severe hypernatremia sharply increased. Since both hypernatremia and hyperglycemia are probably undesirable, future studies should evaluate the feasibility of integrating adjustment of infusion fluids with glucose control in order to improve both sodium and glucose homeostasis.

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0463

AVOIDING GLUCOSE DYSREGULATION BY COMPUTERIZED GLYCEMIC CONTROL DURING RAPIDLY INCREASED PARENTERAL NUTRITION IN CRITICALLY ILL PATIENTS

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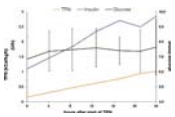
INTRODUCTION. Early delivery of calories is important in critically ill patients. In many patients it may take several days to achieve adequate enteral caloric intake, some patients even cannot be enterally fed for prolonged periods. When optimal caloric delivery is desired under such circumstances, parenteral nutrition (PN) is required. A disadvantage of PN is that it increases glucose levels and thus may interfere with glycemic control, an accepted goal in critical care.

OBJECTIVES. We hypothesized that initiation of PN using a rapid step-up approach, coupled with computerized insulin dosing, will result in a desirable caloric intake within 24 h without creating unacceptable glucose levels.

METHODS. In our ICU we have been using a computerized nurse-centered glucose regulation program (GRIP) for the past 5 years [1]. GRIP was programmed to aim at glucose levels between 4.0 and 7.5 mmol/L. The desired full TPN goal was divided in six steps, to be taken every 4 h. TPN was thus increased with steps of 0.16 kCal/kg per hour (equivalent to 10 ml/h). In the meantime GRIP could adjust the continuous insulin infusion rate when appropriate. In case glucose levels became ≥10 mmol/L, TPN was not increased until GRIP had regulated glucose levels <10 mmol/L. Both insulin and TPN were administered by nurses according to GRIP and the step-up protocol. Physicians were only consulted when extreme glucose levels (<4 or >15 mmol/L) developed. We analysed all glucose-related data over the first 24 h for 23 consecutive patients who were started on TPN in our ICU.

RESULTS. 23 consecutive patients aged 51 ± 19 years with an mean APACHE-II admission score of 18 ± 5 were studied. Within 24 h mean caloric intake was 1 kCal/kg per hour (Fig. 1). During the 552 h patient observation period, 132 glucose samples with a mean glucose level of 7.4 ± 1.4 mmol/L were taken. There were no glucose levels outside the 4–15 mmol/L range. Only six samples (5%) had a glucose level ≥10 mmol/L. Mean insulin infusion rate was more than doubled by GRIP from 1.1 ± 1.5 to 2.9 ± 2.5 U/h.



TPN and insulin dose during study period

CONCLUSION. This proof of concept study shows that a nurse-centered rapid initiation of TPN using a step-up approach and simultaneous computerized insulin therapy resulted in adequate caloric intake within 24 h without inducing hyperglycaemia or hypoglycemia (Table 1)

TABLE 1 PATIENT CHARACTERISTICS

Patients	*N*; mean ± SD; (range)
Males/females	18/5
Age (years)	51 ± 18.6
Apache II	17.9 ± 5.3
Diabetes	1 (4%)
Receiving steroids	7 (30%)
Mechanical ventilation	17 (74%)
Body Mass Index	25 ± 6
Hopital mortality	4 (17)
Insulin requirements (U/day)	46 ± 37 (0–159)

REFERENCE(S). 1. Vogelzang M, Loef BG, Regtien JG et al (2008) Computer-assisted glucose control in critically ill patients. Intensive Care Med 34:1421–1427.

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HYPERGLYCEMIA DURING HEPATIC RESECTION WITH PRINGLE MANEUVER: CONTINUOUS MONITORING OF BLOOD GLUCOSE CONCENTRATION

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INTRODUCTION. Hepatocytes contribute to blood glucose homeostasis under physiological conditions by storing or releasing glucose [1]. Therefore, hepatic surgery is often associated with deterioration of glucose homeostasis. However, the trends of blood glucose concentrations during hepatic resection have not been clearly defined.

OBJECTIVE. We previously demonstrated the postoperative hyperglycemia after hepatic resection (Okabayashi et al. 20th ESICM). This is the further study of continuous monitor of the blood glucose concentrations during hepatic resection involving Pringle maneuver.

METHOD. 30 patients undergoing hepatic surgery in our institute were enrolled. The ethics committee of our institution approved all study protocols, and informed consent was obtained. Blood glucose concentration during hepatic resection was continuously measured by an artificial endocrine pancreas system, STG-22. Values are expressed as mean ± standard error. Statistical analysis of blood glucose concentration was performed by paired *t* tests and non-repeated ANOVA. The relationship between changes in glucose concentration and clinical parameters was analyzed using the Mann–Whitney *U* test or correlation. A value of $P < 0.05$ was considered significant.

RESULT. Glucose concentrations followed a similar up-and-down pattern in all patients during surgery. From baseline levels at the start of surgery (102.4 ± 14.4 mg/dl), glucose concentrations gradually and significantly increased until the start of liver resection (140.3 ± 23.8 mg/dl) ($P < 0.01$, paired *t* test). The glucose levels decrease during clamping of the hepatoduodenal ligament and immediately and profoundly increased after unclamping. This trend of decrease and increase was repeated with the second round of clamping and unclamping, and so on. After the last Pringle maneuver, glucose concentrations gradually declined in 27 cases and increased in 3 cases. Patients with pathologically confirmed liver cirrhosis showed smaller elevations in glucose concentration after the first unclamping compared to patients without liver cirrhosis ($P < 0.05$). However, there was no statistically significant relationship between glucose elevation after the first unclamping and a panel of other clinical parameters reflecting hepatic function, diabetes status, and surgery.

CONCLUSION. The present study revealed, for the first time, a rapid and profound transition in glucose concentration during hepatic resection. This rapid increase in blood glucose concentration might involve glycogen breakdown due to hypoxia from the ligament clamping [2], although further study is necessary to reveal the underlying mechanism.

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0465

COMBINATION OF CONTINUOUS GLYCAEMIA MONITORING WITH COMPUTERIZED MODEL PREDICTIVE ALGORITHM WITH VARIABLE SAMPLING INTERVAL (EMPC) FOR THE INTENSIVE INSULIN THERAPY IN CARDIAC SURGERY PATIENTS

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INTRODUCTION. Increased blood glucose levels are frequently observed in patients undergoing cardiac surgery procedures, with or without diabetes. Glycaemia control is one of the factors decreasing mortality, length of hospitalization and number of complications as it has been shown in previously published studies. Many protocols have been developed to implement glycaemic control. The aim of this study was to assess the effectivity of the system which is combination of continuous glycaemia monitoring (CGM) with computerized model predictive algorithm with variable sampling interval (eMPC) in the postoperative period in cardiac surgery patients.

METHOD. Twenty patients undergoing elective cardiac surgery were enrolled into the study. 10 patients were randomized into the group eMPC-CGM, 10 patients into the standard group. In the eMPC-CGM group the eMPC algorithm was managed by the glycaemia obtained every 15 min from continual glycaemia system (Guardian RT CGMS). The accuracy of CGM was under consideration every 1 h through the use of referential arterial blood glycaemia and Clark Error-Grid Analysis (C-EGA). In the case of clinically non-acceptable values the referential glycaemia was used as input information for eMPC and simultaneously for recalibration of CGMS. Control group ($n = 10$) was treated by the routine paper insulin protocol used in postoperative ICU. Duration of the study was 24 h. Continuous insulin infusion was administrated to maintain glycaemia in a target range of 4.4–6.1 mmol/l. Statistical analysis—the patients from different groups were compared using ANOVA followed by Holm–Sidak test, Student *t* test or Mann–Whitney *U* test as appropriate. The significance level was set at $p = 0.05$.

RESULTS. Total amount of paired glycaemic values was 231. 227 values (97%) were found in the clinically acceptable zone C-EGA and only 7 values (3%) were found in the clinically non-acceptable zone D. Only two patients required more than one additional recalibration by the referential glycaemia. Mean blood glucose was significantly lower in the eMPC-CGM group versus control group (6.1 ± 0.1 vs. 6.6 ± 0.1 mmol/l, $p < 0.05$) and also percentage of time above the target range was shorter in the eMPC-CGM group versus control group (37.2 ± 2.6 vs. $52.8 \pm 5.6\%$, $p < 0.05$). Percentage of time in the target range was significantly higher in eMPC-CGM group versus control group (49.6 ± 5.9 vs. $41.9 \pm 2.6\%$, $p < 0.05$). No severe hypoglycaemia (defined as a blood glucose level of 2.9 mmol/l or less) in the eMPC-CGM group occurred during the study compared to five episodes in the control group.

CONCLUSION. In our study, the eMPC-CGM combination demonstrated sufficient accuracy and reliability for the future testing in a larger group of patients. Above mentioned combination could be a promising step to develop fully automated closed system for the continuous insulin infusion.

GRANT ACKNOWLEDGEMENT. This study was supported by grant of Charles University in Prague—GAUK 44407.

0466

EFFECT OF TIGHT GLUCOSE CONTROL ON HYPERLACTATEMIA AFTER CARDIAC SURGERY

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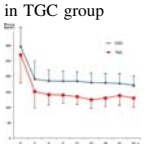
INTRODUCTION AND OBJECTIVES. Hyperlactatemia after cardiac surgery is associated with high mortality and hyperglycemia is a risk factor. Tight glucose control (TGC) with continuous insulin infusion has been performed after cardiac surgery to improve mortality and morbidity. The aim of this study is to determine the effect of TGC on hyperlactatemia and outcome.

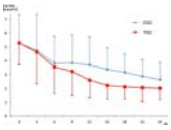
METHODS. By retrospective chart review, we evaluated 157 nondiabetic adult patients undergoing elective valvular surgeries with cardiopulmonary bypass (CPB). The each blood glucose level was maintained within a target range below: 80–130 mg/dl in TGC group and 100–200 mg/dl in conventional glucose control (CGC) group. We collected the data on perioperative clinical variables including patient demographics, duration of CPB, time to extubation, length of ICU stay and hospital stay. In addition, we recorded postoperative laboratory data of arterial blood gas analysis, serum glucose and serum lactate. We compared postoperative changes in glucose and lactate and postoperative outcome between the two groups. The groups were compared by *t* test, χ^2test, or Mann–Whitney *U* test, as appropriate. And change of glucose and lactate over time were assessed by calculating area under the variable-time curve. Data were expressed as mean ± SD or proportions. $P < 0.05$ was considered significant.

RESULTS. Postoperative glucose levels (Graph 1, $P < 0.01$) and lactate levels (Graph 2, $P < 0.01$) were significantly lower in TGC group. Length of ICU stay was shorter in TGC group ($P < 0.05$), however, duration of postoperative ventilation and length of postoperative ward stay were similar in both group.

CONCLUSIONS. TGC using continuous insulin infusion was related to lower lactate levels. The length of ICU stay was shorter in TGC group



Glucose level in TGC group and CGC group



Lactate level in TGC group and CGC group

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Ventilatory modes and positioning: 0467–0480

0467

HIGH FREQUENCY OSCILLATION AND TRACHEAL GAS INSUFFLATION VERSUS STANDARD HIGH FREQUENCY OSCILLATION: COMPARISON OF GAS EXCHANGE AT TWO LEVELS OF TRACHEAL PRESSURE

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INTRODUCTION. In acute respiratory distress syndrome (ARDS), combined high-frequency oscillation (HFO) and tracheal gas insufflation (TGI) may improve oxygenation through a TGI-induced increase in tracheal pressure. We compared standard HFO and HFO–TGI matched for tracheal pressure. To further elucidate the mechanism of TGI action, we also compared HFO and HFO–TGI matched for mean esophageal pressure (Pes), used as lung volume indicator.

METHODS. In our 37-bed, university intensive care unit, we conducted a prospective, randomized, crossover, main and complementary study. In the main study, we enrolled 22 patients with early acute lung injury or ARDS. In the complementary study, we enrolled another 10 patients fulfilling main study's enrolment criteria.

INTERVENTIONS OF MAIN STUDY: On day 1, patients were ventilated with HFO, without (60 min) and combined with TGI (60 min) in random order. HFO/HFO–TGI sessions were repeated in inverse order within 7 h. HFO/HFO–TGI mean tracheal pressure was equal to or 3 cm H_2O higher than preceding conventional mechanical ventilation (CMV) tracheal pressure. On day 2, the protocol was repeated at the alternative tracheal pressure level relative to Day 1.

INTERVENTIONS OF COMPLEMENTARY STUDY: Two sets of HFO/HFO-TGI sessions separated by 7 h of CMV were performed, initially in random and then in inverse order. HFO/HFO–TGI were matched for preceding CMV mean Pes.

RESULTS. Gas-exchange and hemodynamics were determined before, during, and after HFO-sessions.

MAIN STUDY: At both tracheal pressure levels, HFO-TGI versus HFO improved average PaO_2/inspired O_2 fraction (FiO_2) by 42–58% ($P < 0.001$), and average $PaCO_2$ by 13–16% ($P = 0.037$–0.09). Preliminary Pes measurements suggested that TGI increased lung volume.

COMPLEMENTARY STUDY: At equal mean Pes, HFO–TGI versus HFO resulted in 15% higher average PaO_2/FiO_2 ($P = 0.67$). In both studies, hemodynamics and CMV respiratory mechanics remained unchanged.

CONCLUSIONS. At the same tracheal pressure level, HFO–TGI results in superior gas exchange compared to HFO. This is mainly due to a TGI-induced increase in lung volume.

0468

HFOV USED AS A RESCUE STRATEGY FOR CO_2 CLEARANCE AFTER FAILURE OF CONVENTIONAL VENTILATION IN PATIENTS WITH VARIOUS CLINICAL ENTITIES DUE TO ACUTE RESPIRATORY FAILURE

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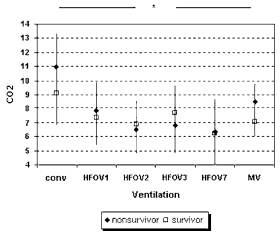
INTRODUCTION. High-frequency oscillatory ventilation (HFOV) can provide adequate gas exchange, sustaining protective lung ventilation by using only very small tidal volumes. We initiated HFOV in cases of ARF when it was impossible to achieve sufficient CO_2 elimination with low tidal volume ventilation.

METHODS. Between 6/07 and 03/09 14 patients (4 females, 10 males), mean age 55 years (range 26–73), suffering from ARF were treated with HFOV. The reasons for ARF demonstrated the wide range of pulmonary diseases that can lead to life threatening organ dysfunction. After performing lung recruitment manoeuvres in all patients, the standard setting for HFOV were 6 Hz, a PIP 5 cm H_2O over the Pmean and the I:E ratio of 40%. The medial HFOV treatment was 3,9 days (range 1–8 days).Routine measurements of oxygenation were done under conventional ventilation (conv), immediately after beginning HFOV (HFOV1), after stabilisation of patients (HFOV2 <8 h), during HFOV (HFOV3), immediately before stopping HFOV (HFOV7) and shortly after resuming conventional pressure controlled ventilation (MV). Statistical analysis was performed using the Mann–Whitney test.

RESULTS. In all cases the failure of CO_2 elimination could be stopped and gas exchange was initially improved.

Figure 1 shows the mean pCO_2 values and standard deviation at each measurement point.



*: $p = 0.009$

After resuming conventional ventilation (MV) there was a significantly lower mean pCO_2 ($p = 0.009$) compared with initial lung protective ventilation (conv) in all patients (9 survivors, 5 nonsurvivors). Also during HFOV mean pH levels returned to normal, without any statistically differences between survivors and nonsurvivors.

CONCLUSIONS. HFOV can provide adequate CO_2 clearance in some patients with ARF due to various etiologies. In cases where conventional lung ventilation cannot provide adequate gas exchange, HFOV can improve oxygenation and in these patients HFOV also achieved sufficient CO_2 elimination.

0469

HIGH-FREQUENCY OSCILLATORY VENTILATION (HFOV) IN ADULTS WITH ACUTE RESPIRATORY DISTRESS SYNDROME (ARDS) AS A RESCUE THERAPY TO CONVENTIONAL MECHANICAL VENTILATION (CMV)

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OBJECTIVES. Evaluate the effectiveness and safety of the HFOV in adults with severe Acute Respiratory Distress Syndrome (ARDS) when fails the conventional mechanical ventilation (CMV).

METHODS. Observational pilot study. We included 64 patients, >18 years (47 male/17 female), with ARDS (Conference consensus 1994), admitted to ICU from August 2003-November 2008; when failed CMV, defined by one of the following criteria: $FiO_2 \geq 0.70$ with a $PaO_2 \leq 60$, plateau pressure $\geq$35 cmH_2O or PEEP $\geq$10 cmH_2O. Baseline APACHE II score was 24 (19–30) and ARDS Lung Injury Score $\geq$2.5. We considered HFOV failure when: (1) PaO_2/FiO_2 ratio <50 after 24 h treatment—despite increased Airway Pressure (Paw) 40 cmH_2O and $FiO_2$1—or (2) ventilation failed ($PaCO_2 \geq 80$ mmHg, pH < 7.20). 32 patients had multiple-organ failure, and 31 required continuous venovenous hemofiltration.

INTERVENTIONS: The HFO Sensormedics 3100B® was used. The initial Paw was 2–3 cmH_2O higher than Paw in CMV, defined to maintain $SatO_2 \geq 88\%$ or PaO_2>55 mmHg. If $SatO_2$ was $\geq$88–90%, then FiO_2 was reduced to a FiO_2 target $\leq$0.60. If $SatO_2$ was $\leq$88%, then Paw was increased by 1–2 cmH_2O to maximum Paw of 40 cmH_2O. The $PaCO_2$ targeted range was 35–80 mmHg, with a pH $\geq$ 7.25. $PaCO_2$ was adjusted increasing DP. If hypercapnia persisted despite a DP > 100 cmH_2O, oscillatory frequency was reduced in steps of 0.5 Hz to a lower limit of 3 Hz. After HFOV, we made a recruitment manoeuver (RM): maintaining 40–45 cmH_2O for 40–45 s. Patients requiring a $FiO_2 \leq 0.40$ and Paw $\leq$ 22 cmH_2O were weaned to CMV.

STATISTIC: Base-line and outcome variables are expressed in means or medians. Comparisons of measured variables over time in individuals was made by a paired *t* test. Comparisons between survivors and nonsurvivors were determined by two-tailed Mann–Whitney *U* rank sum test. All calculations were performed by SPSS15.0.

MEASUREMENT AND RESULTS. Gasometrical, hemodynamic and oscillator parameters were monitored during transition from CMV to HFOV and 30 min, 4, 12, 24 and 48 h after oscillator. During the first 24 h, the Paw was reduced to the one used in CMV. HFOV increased PaO_2/FiO_2 ratio, as early as 30 min, and showed a PCO_2 decreased with regard to the basal values during the CMV; as well as in the systemic pressure. 38 patients (59.37%) were responders to the rescue therapy. Complications observed during HFOV: seven episodes of Pneumotorax (11.9%) and in four of these cases required removal due to hypotension (6.8%). 30-day mortality: 40 patients (62.5%) 89% due to multisystemic failure. A significantly higher 30-day mortality was observed in patients on CMV $\geq$4 days prior to HFOV.

CONCLUSIONS. Our results suggest that HFOV proves to be beneficial in the rescue of patients with severe ARDS, regarding its safety and effectiveness in gas interchange. Prolonged CMV previous to HFOV was associated with higher mortality. Mortality can be related to the multisystemic failure.

0470

COMPARISON OF DIFFERENT GAS HUMIDIFICATION DEVICES DURING HFO. A BENCH STUDY

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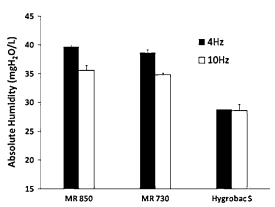
INTRODUCTION. Few data are available for gas humidification during HFO. Currently, only active humidification is used for this purpose, considering that additional dead space may be an issue in this specific situation. Also, the HFO circuitry only allows the use of active humidification. We assessed the performances of different humidification device during HFO, including HME and a newly available unclassified system (Hydrate).

METHODS. We measured on bench gas humidity (with psychrometric method) of different humidification devices (MR 730, MR 850, HC 200, Hydrate, Hygrobac S and Hygrobac) using previously described methods [1, 2]. The devices were connected to a HFO ventilator set as per Oscillate study recommendations : Flow 40 L/min, Amplitude 90 cmH_2O, Ti 33%, Mean pressure 30 cmH_2O, at two different oscillation frequencies: 4 and 10 Hz. Two different ambient temperature were used: 23 and 29°C. Three measurements were performed at steady state.

RESULTS. Preliminary results are presented on the Fig. 1. Absolute Humidity at 23°C of ambient temperature.



CONCLUSIONS. Both heated humidifiers performed well within the tested conditions.

The small HME tested performed reasonably well. Impact of dead space on alveolar ventilation and of HME's resistive properties remains to be assessed.

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0471

BIOLOGICAL MARKERS OF LUNG INJURY BEFORE AND AFTER THE INSTITUTION OF HIGH FREQUENCY PERCUSSIVE VENTILATION IN SPONTANEOUSLY BREATHING SURGICAL ICU PATIENTS

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INTRODUCTION. Several biological markers of lung injury are predictors of morbidity and mortality in patients with acute lung injury (ALI). The low tidal volume lung-protective ventilation strategy is associated with a significant decrease in plasma biomarker levels compared to the high tidal volume ventilation strategy. The primary objective of this study was to test whether the institution of high frequency percussive ventilation in spontaneously ventilating patients after surgery admitted in the ICU could be responsible for lung injury by using measurements of biomarkers of lung injury before and after starting HFPV.

METHOD. A prospective observational cohort study was conducted in the intensive care unit. Fourteen spontaneously breathing patients admitted in the ICU after surgery were enrolled. Physiologic data and serum samples were collected on admission before starting HFPV and at two different time points within the first 24 post operative hours after starting physiotherapy with HFPV to measure the concentration of interleukin (IL)-6, IL-8 and TNFalpha. The differences in biomarker levels before and after HFPV were analyzed using repeated measures analysis of variance and a paired t test with correction for multiple comparisons.

RESULTS. On admission in the ICU after surgery, all of the biological markers (IL-8, IL-6 and TNFalpha) were normal in these spontaneously breathing patients suggesting no significant postoperative lung injury. After the institution of HFPV with face mask or nose piece, none of the biological markers was significantly increased at either an early (3 ± 2 h) or later (20 ± 3.5 h) time point. During the 24-h period with HFPV, the PaO_2/FiO_2 (partial pressure of arterial oxygen/fraction of the inspired oxygen) ratio significantly increased without side effects.

CONCLUSION. Levels of IL-8, IL-6, and TNF are not elevated in spontaneously ventilating patients receiving HFPV for postoperative physiotherapy. The institution of HFPV does not increase the levels of biological markers of lung injury. These results suggest that the institution of HFPV does not worsen the pre-existing lung status in most patients admitted in the ICU after surgery and could enhance blood oxygenation during this critical period.

0472

INFLUENCE OF LOW TIDAL VOLUME VENTILATION WITH AND WITHOUT PERIODIC RECRUITMENT MANOEUVRES ON CYTOKINE AND AMPHIREGULIN RELEASE IN ALI/ARDS PATIENTS

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INTRODUCTION. Patients suffering from ARDS benefit from low tidal volume ventilation (LV) [1]. Increase of alveolar pressure can induce pro-inflammatory cytokines which may lead to the development of ventilator induced lung injury (VILI) [2]. The effect of routinely performed recruitment manoeuvres (RM) on cytokine and amphiregulin release, a most recently identified indicator of mechanical alveolar stress [3], is not known.

OBJECTIVE. The aim of the present study was to compare LV ventilation with an open lung approach (OLA) via periodic RM in ARDS patients in terms of pulmonary and systemic cytokine and amphiregulin release.

METHODS. After approval of the local ethic committee 11 ALI/ARDS patients were randomized to the LV ($n = 6$) or the OLA group ($n = 5$). The ventilator setting was based on the ARDSnet protocol [1], i.e. pressure control ventilation, V_T 6–8 ml/kg/KG. In the OLA group periodic RM (PEEP 25 cmH_2O, inspiratory pressure elevated stepwise to 40, 50, 60 cmH_2O) were performed routinely every 8 h, after bronchoalveolar lavage (BAL) and in cases of a decrease (20%) of oxygenation or an increase (20%) in pCO_2. If a therapeutic RM was performed the PEEP level was increased by 2 cmH_2O. During the study (T0, T1, T2, T3; 24 h frequency of measurements; 72 h evaluation period) cytokines (IL-6, IL-8, IP-10) and amphiregulin were analyzed in BAL fluids and serum samples. A repeated mixed-model-analysis was performed for statistical purposes with T0 as a covariate.

RESULTS. BAL cytokine concentrations (IL-6, IL-8, IP-10) showed no differences between the study groups. In contrast, amphiregulin concentrations were elevated in the BAL of the OLA group ($p = 0.007$). Serum concentrations of IL-6 (0.0019) and IL-8 (0.006) were significantly reduced in OLA patients compared to T0, which was paralleled by a reduction of the APACHE-II Score.

CONCLUSION. Periodic recruitment manoeuvres increase pulmonary mechanical stress indicated by higher alveolar amphiregulin concentrations. Patients treated with an OLA showed a tendency towards reduced systemic inflammatory responses and the severity of critical illness.

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0473

FEASIBILITY OF PROPORTIONAL ASSIST VENTILATION AS ROUTINE VENTILATORY SUPPORT IN INTENSIVE CARE PATIENTS

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RATIONALE. Proportional Assist Ventilation (PAV) is an assisted ventilatory mode that applies pressure in proportion to patient inspiratory effort. Caregivers decide gain level in order to unload work of breathing. High assistance of PAV could be comparable with control ventilatory modes. However, this mode has not spread as daily mode in routine practise

OBJECTIVE. To asses PAV feasibility as routine ventilatory support in the acute phase of critically ill patients, where high assistance is needed.

METHODS. Inclusion criteria: patients under assist control ventilation (ACV), hemodynamically stable and suitable for triggering ventilator. PAV+ was initially set at 90% in order to get the highest assistance. FiO_2 and PEEP were managed according to routine practise. Breathing pattern, respiratory mechanics and blood gas analysis were recorded daily until weaning or PAV failure, based on attending physician decision.

RESULTS. We screened 110 patients, but only 19 fulfilled the criteria. PAV failed in 7 patients due to hemodynamic instability [1], metabolic acidosis [2], hypercapnia [2], high respiratory rate [1] and high airway pressure [1]. Failure patients showed worse respiratory mechanics (see Table 1), mainly Paw, Resistance and WOB.

TABLE 1 MEAN VENTILATORY PARAMETERS DURING ICU STAY

	PAV success $n = 12$	PAV failure $n = 7$	p
Vt (mL)	528.5 ± 117.3	599.3 ± 15	0.2
RR (min^{-1})	22 ± 6	23 ± 8	0.6
Vmin (L)	10.3 ± 3	11.7 ± 5	0.4
PEEP (cmH_2O)	7.3 ± 2.3	7.2 ± 1.5	0.9
PaO_2/FiO_2(mmHg)	279.4 ± 100	224.5 ± 46	0.2
pH	7.41 ± 0.04	7.36 ± 0.09	0.1
$PaCO_2$(mmHg)	38 ± 5.7	41 ± 8	0.2
% PAV	79 ± 0.1	83 ± 0.1	0.3

CONCLUSION. PAV was easily performed in 63% of cases, whereas interruption was associated with clinical events related to basal illness. PAV failure also seems related to worse mechanical characteristics (Table 2)

TABLE 2 MEAN VENTILATORY PARAMETERS DURING ICU STAY

	PAV success $n = 12$	PAV failure $n = 7$	p
Peak Paw (cmH_2O)	21.1 ± 5	28 ± 4.6	0.01
ComplianceRS (mL/cmH_2O)	57 ± 22	51 ± 20.2	0.5
Resistanceaw (cmH_2O/L/seg)	6.3 ± 1.7	8.4 ± 2.2	0.001
WOB (J/L)	1.08 ± 0.3	1.6 ± 0.2	0.0004
MV length (days)	10.6 ± 8.4	9.6 ± 4	0.8
PAV length (days)	4.4 ± 3.7	3.6 ± 2.3	0.6

0474

INTERVENTIONAL LUNG ASSIST CAN ATTENUATE THE INVASIVENESS OF MECHANICAL VENTILATION IN ARDS

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BACKGROUND. To describe the clinical usability of a new pumpless extracorporeal membrane ventilator (Novalung) in an ICU population with severe respiratory insufficiency.

METHODS. Retrospective report of a mixed cohort of 13 consecutive patients from operative and medical ICUs at a university hospital with established ARDS. Management consisted of transcutaneous placement of femoral arteriovenous pumpless extracorporeal lung assist device (pECLA) to allow lung-protective ventilation by the immediate and sustained reduction of tidal volume, inspiratory pressure and respiratory frequency.

RESULTS. Mean SAPS II score was 49.5 ± 6.6, ICU mortality was 53% (7/13). Mean length of ICU stay was 55.7 ± 20.9 days for survivors (S) and 30.1 ± 9.4 days for nonsurvivors (NS). Total time on pECLA was 26 ± 16 days (S) and 9 ± 2.1 days (NS), total time on mechanical ventilation was 42.5 ± 14.5 (S) and 29.9 ± 7.6 days (NS). pECLA was followed by a significant increase in oxygenation index from 107 ± 15 to 200 ± 28 mmHg. Hypercapnia was sharply reduced from 80.9 ± 5.1 (pre pECLA) to 55 ± 4 mmHg (day 1), while minute volume, respiratory rate and inspiratory pressure could be markedly decreased. Complications consisted of one minor bleeding event and two inadvertent decannulations.

CONCLUSION. pECLA is an efficient technique with a low complication rate to support gas exchange in ARDS patients widening the therapeutic options towards prolonged periods of effective protective ventilation.

0475

HEMODYNAMIC EFFECTS OF INTERVENTIONAL LUNG ASSIST IN ACUTE RESPIRATORY DISTRESS AND SEPTIC INFLAMMATORY RESPONSE SYNDROMES

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INTRODUCTION. Therapy with a pumpless arteriovenous membrane oxygenator [interventional lung assist (ILA)] has been used in the treatment of the acute respiratory distress syndrome (ARDS) to facilitate a lung protective ventilation strategy. A systemic inflammatory response syndrome (SIRS) may be present as the cause or accompanying the ARDS. The characteristics of the hemodynamic pathology of SIRS include hyperdynamic circulation and intravascular volume depletion. The use of ILA creates and requires an arteriovenous shunt that might cause hemodynamic problems by reducing the afterload. The aim of our study was to examine the consequences of this shunt on the cardiac function.

METHODS. The study was designed as a prospective experimental study. 6 pigs (43–58 kg body weight) were anesthetized and mechanically ventilated. ARDS was induced by repeated bronchoalveolar lavages. Volume substitution was performed with Ringer's lactate and hydroxy-ethyl-starch solutions until pulmonary artery occlusion pressure (PAOP) was above 20 cm H_2O. ILA was set up using one 17 Fr venous and two 13 Fr arterial cannulae. Cardiac output, PAOP, arterial pressure and the echocardiographic parameters of left ventricular end diastolic area and fractional area contraction were measured (vivid 7 pro, GE Healthcare, München, Germany). The hemodynamic changes before and after the opening of the ILA shunt were examined. A paired, two-tailed t test was performed using GraphPad Prism (Version 5 for Windows, GraphPad Software, San Diego, USA) and significance was accepted at P values <0.05. The data is given as mean ± SD.

RESULTS. The ILA shunt of 1.5 (±0.4) L/min altered the studied parameters before and after opening the ILA, respectively, as follows: cardiac output 11.7 (±2.3) to 11.6 (3.3) L/min, PAOP 21.2 (±1.5) to 19.2 (4.8) cmH_2O, mean arterial pressure 83 (±13.0) to 69 (±19.5) mmHg, enddiastolic area of the left ventricle 9.4 (±1.8) to 10.0 (±2.7) cm^2 and the fractional area contraction from 82 (±9.0) to 85 (±9.0)%. Only the change in cardiac output was significantly different ($P = 0.013$).

CONCLUSIONS. The mean arterial pressure fell moderately but significantly when ILA was applied. Other hemodynamic parameters exhibited only minimum and mostly insignificant changes after the ILA use was initiated. We conclude that, with the usual monitoring, these hemodynamic changes should easily be accounted for and they should not prevent the use of ILA if its use in ARDS is indicated.

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0476

EFFECT OF PRONE POSITIONING (PP) ON LUNG VOLUME AND OXYGENATION

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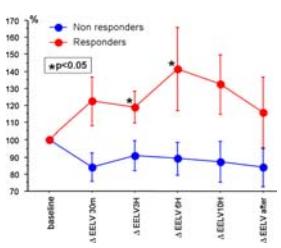
RATIONALE. Prone position may contribute to the reduction of aerated lung volume of patients with ARDS. We looked for a relationship between change in lung volume and oxygenation during this manoeuvre. An automated measurement of end expiratory lung volume (EELV) using nitrogen (N_2) washout/washin is available in an ICU ventilator (Engstrom, GE).

PATIENTS AND METHODS. 9 patients with severe ARDS ($PaO_2/FiO_2 = 118 \pm 27$ mmHg) were studied. Patients were ventilated in volume controlled (Vt 6 mL/kg PBW and flow = 60 L/min). We evaluated prolonged (10–12 h) PP sessions. Arterial blood gas, EELV, and static compliance were measured before PP and after 30 min, 3, 6 and 10–12 h of prone positioning; another measure was realised 30 min after back to supine position. Responders were defined as PaO_2/FiO_2 ratio increase under 30% of base line after 30 min PP.

RESULTS. Increase in PaO_2/FiO_2 ratio (159 ± 66%, $p = 0.02$) was observed from 30 min and last until the end of PP session. $PaCO_2$ decreased all along study ($p = 0.01$). PaO_2/FiO_2 ratio decreased when patient went back to supine. PaO_2/FiO_2 ratio of nonresponders ($n = 4$) remained low during whole PP session. EELV of responders was lower ($p = 0.01$) before PP, and increased significantly at 3 and 6 h (Fig. 1).



EELV during PP

Changes in position (prone to supine and supine to prone) were associated with mild and transient variations of compliance ($p < 0.05$ for compliance at 30 min after PP and after return to supine position). No correlation was found between EELV and compliance. Correlation between variations of EELV and of PaO_2/FiO_2 ratio after 30 min PP was not significant ($p = 0.08$).

CONCLUSION. Preliminary data on nine patients showed prone positioning of patients with ARDS may increase PaO_2/FiO_2 ratio and EELV. Association between lung volume and oxygenation has to be confirmed.

0477

COMPARISON OF POTENTIALLY RECRUITABLE LUNG (PRL) IN SUPINE VERSUS PRONE POSITION. PRELIMINARY DATA

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INTRODUCTION. In ALI/ARDS patients, the percentage of potentially recruitable lung is highly variable. Considering the proposed pathophysiological mechanisms by which prone position (PP) improves oxygenation, and its probable protective effect on mechanical ventilation, we thought that PRL from patients with early ARDS may be higher when it is measured in PP. Similarly, the response to PEEP could be better in prone, reflecting an improvement in the distribution of the different compartments in the ARDS lung, obtaining better aeration without unnecessary exposure to increased stress and strain. The aim of this study was to compare the PRL, as well as the changes in the distribution of lung compartments in supine versus prone, according to density detected by CT.

METHODS. 9 ARDS patients with <72 h of MV and PaO_2/FiO_2 persistently below 200, underwent whole-lung CT during breath-holding sessions at consecutive airway pressures of 5, 45, and 15 cmH_2O, in both supine and prone position (position was applied in random order). All patients were sedated and paralyzed. The percentage of potentially recruitable lung was defined as previously described Gattinoni et al. [1], Non aerated tissue (NAT) at 5–45 cmH_2O)/total weigh. A recruitment manoeuver (RM) was performed before CT session at 45 cm of water (Pressure-controlled mode with inspiratory pressure of 25 cmH_2O, and PEEP 20 cmH_2O, I/E ratio 1:1, RR 15× min, during 1 min). The TV was performed at 6 ml/kg, and FiO_2 and RR were adjusted to maintain O_2 sat ≥93%, and $PaCO_2$ <55 mmHg. CTscan images were obtained for each position, and level of PEEP. *t* test was used to compare results, with a $p < 0.05$ as significant.

RESULTS. We analyzed 9 ARDS patients, mean age 60 ± 21 years (3 male), 5 medical–4 surgical admissions, APACHE II 22 ± 6, SOFA 11 ± 3, SAPS II 46 ± 10, MV time 50 ± 18 h, PaO_2/FiO_2 168 ± 52, plateau pressure 25 ± 2, compliance 34 ± 5 ml/cmH_2O, and mean IAP was 11 ± 5 mmHg. Lung weight was 1233 ± 377 g. Non aerated tissue was reduced from 471 ± 236 to 293.3 ± 182 g in supine, and from 441.9 ± 230 to 232 ± 190 g in PP. Only in PP the reduction of NAT was significant ($p = 0.065$ for supine, and $p = 0.05$ for PP). PRL was 14.4 ± 8% in supine, and 18 ± 8% in PP ($p = 0.26$). At PEEP 15 cmH_2O, after RM, the percentage of well aerated tissue (WAT) was higher in prone than supine position (54 ± 13 vs. 60 ± 11%, $p = 0.038$), and Hyperinflated tissue (HIT) and NAT were lower in PP than supine, but these difference were not significant ($p = 0.41$, and $p = 0.28$, respectively).

CONCLUSIONS. Our preliminary data suggest that PP provide a better distribution of the lung regions, increasing WAT, and reducing NAT and HIT in comparison with supine position for the same level of PEEP after RM. PRL has a trend to increase in PP, but this needs to be confirmed by larger series.

REFERENCES. 1. Gattinoni et al (2006) NEJM 354:1775–1786

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0478

PRONE POSITION FOR ACUTE RESPIRATORY DISTRESS SYNDROME IN CARDIAC INTENSIVE CARE

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INTRODUCTION. Although prone positioning has been shown to be a useful adjunct for the treatment of severe hypoxia in respiratory failure, it does not improve survival.

OBJECTIVES. The aim of this study was to assess the safety and efficiency of prone position ventilation (PP) in patients with adult respiratory distress syndrome (ARDS) in patients admitted in cardiac intensive care.

METHOD. We analyzed retrospectively ARDS patients ventilated in prone position, between Jan 2003 and Dec 2008. Demographic data were recorded. The turning maneuver followed an established protocol. Parameters registered were: oxygenation index (PaO_2/FIO_2) and $paCO_2$ before, during PP and in the fist 12 h after returning to dorsal recumbent position (DP). The incidence of complications related to the turning episodes and the outcome were also registered. Statistical values are expressed as the median, mean ± standard deviation. Student *t* test was used to compare values. $P < 0.05$ was considered significant.

RESULTS. 41 patients (19 male, 22 female, mean age 57 ± 15 years) were ventilated in PP for a mean duration of 11.5 ± 3.7 (range 5–20) h. There were 35 (85.4%) cardiac surgical patients with drainage tubes, and 8 of them (22.8%) associated intra-aortic balloon pump (IABP). Six patients (14.6%) had beyond PP simultaneous IABP, renal replacement therapy (CRRT) and chest drainage. For the entire group, median PaO_2/FIO_2 rises from 106 (range 61–200) before PP to 259 (range 157–478, $p < 0.05$) after it. The PaO_2/FIO_2 ratio improved in 40 (97.5%) patients (responders). After returning to DP, PaO_2/FIO_2 declined to 197 (range 67–507, not significant). Median $PaCO_2$ had decreased from 41.5 to 38.5 mmHg in PP and to 38 mmHg in DP. No death or severe complications associated with PP. There were no CRRT (16/41), IABP (8/41) or tracheostomy tubes (13/41) malfunctions. There were no inadvertent extubation, central line displacement; no brachial plexus stretch injuries, or ocular injury. 18 patients (44%) developed facial pressure sores but no necrosis. The in-hospital mortality in our patients was 41.6%.

CONCLUSION. The results obtained suggest that PP is safe and effective to improve oxygenation in cardiac patients with severe ARDS when it is carried out by a trained staff and within an established protocol. The poor outcome was related to the severity of illness and number of organ failure.

REFERENCE. Guerin C, Gaillard S (2004) Effects of systematic prone positioning in hypoxemic acute respiratory failure: a randomized controlled trial JAMA 292(19): 2379–2387.

0479

EFFECT OF BODY POSITION ON LUNG REGIONAL STRESS/STRAIN RELATION: TOMOGRAPHIC STUDY ON ANIMAL

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INTRODUCTION. Lung strain is the deformation of parenchyma from its resting position (Functional Residual Capacity, FRC) when subjected to an applied force called stress, corresponding to transpulmonary pressure (PTP).

OBJECTIVES. Aim of the study was to evaluate the Stress versus Strain (S/S) relation of five lung regions of interests (ROI) in supine and prone mechanically ventilated animals by using computed tomography (CT).

METHODS. During general anesthesia in four mechanically ventilated pigs we recorded continuously flow, volume and pressure at airways opening as well as esophageal pressure; PTP was calculated. Twelve End-Inspiratory Hold Maneuvers (EIHM) at increasing delivered volumes and one expiratory hold maneuver (EEHM) at zero end expiratory pressure were performed, interposed with tidal ventilation. During each EIHM and the EEHM we made synchronized CT scans at a fixed level between heart and diaphragm. The sequence was repeated in supine and prone position. We analysed five ROIs comprising the entire lung slice and four regions: upper (nondependent), medium (intermediate), lower (dependent) and center (under the heart projection). The ROI strain was computed from the gas content during the EIHM and the gas content at EEHM (corresponding to FRC). Simultaneously, stress was estimated by PTP. Exponential regression of the single S/S curves was performed, tested for statistical significance and compared by Fisher test.

RESULTS. S/S tracings obeyed statistically significant exponential regressions which were statistically different. Dependent ROIs showed, at the same applied stress, a higher strain than the nondependent ROI, both in supine and in prone position. However, the difference between the more strained and the less strained ROI decreased in the prone position.

CONCLUSIONS. At the same stress, strain is inhomogeneously distributed throughout the lung. Prone compared to supine position, attenuates the differences in strain between dependent and nondependent lung regions.

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0480

EFFECTS OF A NEW ROTATIONAL DEVICE ON COMPLICATION RATE DURING PRONE VENTILATION IN PATIENTS WITH ACUTE RESPIRATORY DISTRESS SYNDROME: A RETROSPECTIVE ANALYSIS

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INTRODUCTION. Prone positioning is currently suggested for the treatment of patients with Acute Respiratory Distress Syndrome (ARDS) in whom mechanical ventilation is potentially dangerous [1]. The RotoProne® (KCI Medical Products, San Antonio, TX, USA) is a new electrical medical bed which allows to perform automatically the positional changes during prone ventilation. Potential advantages of this new device are the reduction of staff workload and the standardization of the treatment across different centers. On the other hand, the RotoProne may have some effects on the rate of adverse events related to prone positioning.

OBJECTIVES. The aim of this study is to assess the impact of Rotoprone bed on the incidence of complications during prone ventilation.

METHODS. We retrospectively analyzed the database of a multi-centers, randomized controlled trial on prone positioning in ARDS patients, that has been recently terminated (Prone-Supine II study). In this clinical trial, RotoProne was available in 20/25 participating centres. 168 patients with ARDS were enrolled in the treatment arm, and were kept in prone position for a total of 1,397 study days. In 1140 of these study days, prone positioning was performed with the use of RotoProne bed, while in 257 days the treatment was manually executed (mainly because of RotoProne unavailability). We compared the incidence of adverse events between the days of treatment with Rotoprone and the days of manual treatment.

RESULTS. The overall incidence of complications was similar between the two groups. Use of RotoProne bed was retrospectively associated to a statistically significant decrease in the use of sedation and muscle relaxant, and to a decrease in rate of pressure sores.

CONCLUSION. Despite the potential limitations of this retrospective analysis, our results suggest that RotoProne bed is at least equivalent to the manual execution of prone positioning. Prone ventilation may be performed with this new rotational device without any increased in incidence of clinically relevant complications.

REFERENCE. 1. Dellinger RP et al (2008) Surviving Sepsis Campaign: international guidelines for management of severe sepsis and septic shock. Crit Care Med 36(1):296–327.

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TABLE 1 EFFECT OF ROTOPRONE BED ON COMPLICATION RATE

	RotoProne treatment (events/100 study days)	Manual treatment (events/100 study days)	*p* value
Need for increased sedation/muscle relaxants	27.3	38.1	<0.001
Airway obstruction	13.0	16.3	0.16
Transient Transient desaturation	22.7	21.4	0.64
Hypotension/arrhytmias/increased vasopressors	23.2	26.5	0.27
Loss of venous access	2.02	1.95	0.94
Displacement of the endotracheal tube	1.47	0.39	0.22
Displacement of a thoracotomy tube	0.07	0.03	1.00
Pressure sores	30.0	34.6	0.04
Facial edema	62.5	62.4	0.77

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0481

NON-INVASIVE PREDICTORS IN ACUTE EXACERBATION OF CHRONIC OBSTRUCTIVE PULMONARY DISEASE (AECOPD)

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INTRODUCTION. Accurate prediction for prognosis is important for hospitalized patients with acute exacerbation of chronic obstructive pulmonary disease (AECOPD) requiring mechanical ventilation (MV) and for their family members to make end-of-life issues.

AIM OF THE PRESENT STUDY. To determine if non invasive parameters including APACHE II score, bedside echocardiography could guide the plan of management in patients with AECOPD either ventilatory or conservatively, and if it could predict patient outcome.

PATIENTS AND METHODS. The study was conducted on 60 adult patients with AECOPD, with mean age 60.1 ± 6.2 were admitted to intensive care unite (ICU). All patients were subjected to arterial blood gases (ABGs), APACHE II score and Doppler echocardiography study.

RESULTS. Patients were divided into two groups according to ventilatory requirement invasive or non invasive into group I (34 patients) with need of MV and group II (26 patients) with success of conservative treatment. Our data showed high predictive value for MV necessity for APACHE II score 19.17 ± 3.4 in group I versus 11.46 ± 4.42 in group II ($P < 0.0001$), pH 7.22 ± 0.07 in group I versus 7.33 ± 0.06 in group II ($P < 0.05$), and Doppler evidence of pulmonary hypertension (PH) at a cut off 36.6 mmHg, the accuracy was 85% and can predict the need for MV in 82% of patients in the group I. Increase in the APACHE II score and increase in the mean pulmonary artery pressure (PAPm) 38.73 ± 7.27 versus 45.40 ± 5.53 mmHg ($P < 0.01$), and pulmonary artery systolic pressure (PASP) 42.20 ± 6.87 versus 57.68 ± 5.97 mmHg ($P < 0.0001$) were significantly more in patients who died in comparison to survivors in the failure group.

CONCLUSION. Increased APACHE II score, $PaCO_2$ on and PAP on admission are predictors of the need of MV invasive or non-invasive, also high APACHE II score and PAP could predict mortality.

KEY WORDS. COPD, APACHE II score, mortality

0482

THE USE OF NONINVASIVE MECHANICAL VENTILATION IN COPD PATIENTS WITH SEVERE HYPERCAPNIC ACIDOSIS

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OBJECTIVE. To compare the effect of noninvasive mechanical ventilation (NIV) in acute hypercapnic chronic obstructive lung disease (COPD) with severely acidotic and mildly acidotic patients

METHOD. Patients who were admitted to intensive care unit with acute hypercapnic COPD were analysed in two groups: mild (pH 7.25–7.35) or severe (pH < 7.25) acidosis. Comparison of NIV in consecutively enrolled patients on time to normalise pH and improve $PaCO_2$, duration of NIV treatment, length of stay in hospital and the survey in 28th of the treatment.

RESULTS. 70 COPD patients who were admitted to intensive care unit were included to our study. Thirty-eight patients were severely acidotic and 32 were mildly acidotic. Compared with the mildly acidotic group, the length of time for pH to normalise was significantly high in severely acidotic group (respectively, 32 (7–78) h, 20 (1–76) h, $p< 0.01$). Full face masks were used mostly in severely acidotic group ($p < 0.01$). 14 patients in acidotic group and one patient in mildly acidotic group were needed endotracheal intubation ($p < 0.01$). At the end of the 28th of treatment, 7 patients were died in severely acidotic group, no patient was died in mildly acidotic group. No statistical difference between the length of hospital and intensive care unit stay in both groups.

CONCLUSION. NIV can be tried in some severely acidotic COPD patients, but it can not be as effective and safe as in mildly acidotic COPD patients. To determine the effectivity and safety of NIV in severely acidotic COPD needs further investigations.

0483

EFFECT OF MECHANICAL VENTILATION WITH PEEP ON THE BRONCHODILATOR TREATMENT IN PATIENTS WITH ACUTE ON CHRONIC RESPIRATORY FAILURE

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INTRODUCTION. The inhaled bronchodilators are the main therapeutic measure in patients with Acute On Chronic Respiratory Failure (ACRF). However, the optimal ventilator parameters to achieve the best bronchodilator effect are not defined. It is known that controlled mechanical ventilation with PEEP improves flow distribution in these patients, because of that it may improve the drug effectiveness.

Objectives. to measure, in controlled mechanically ventilated patients receiving inhaled salbutamol, if a PEEP level lower than PEEPi can additionally reduce airway resistance.

METHODS. 8 patients with clinical criteria of ACRF by different causes and receiving controlled mechanical ventilation were included. Salbutamol is administered through aerochamber (between 6 and 10 inhalations according weight). Patients were haemodinamically stable and deeply sedated (Ramsay V–VI). We calculate respiratory mechanics by means of the constant flow occlusion technique, using the ventilator curves (Plateau pressure, Peak inspiratory pressure, PEEPi, V′, Vt, Static compliance, Total resistances). The measurements were registered in 4 phases: with 0 PEEP before the administration of salbutamol and after the treatment. Later a PEEP level equal to 80% of PEEPi was set and after 6 h measurements pre and post-treatment were repeated. Results were analyzed with non-parametrical tests, using a statistical significance level of $p < 0.05$.

RESULTS. Mean age was 60 ± 17 years. 4 patients needed mechanical ventilation (MV) because of respiratory infection, 2 were postsurgical patients and 2 needed MV after a cardiac arrest. The ventilator parameters were: FiO_2: 0.5 ± 0.07, Vt: 568 ± 82 cc, FR: 15 ± 3 bpm, V′: 0.75 ± 0.12 l/s, PEEPi: 9 ± 3 cmH_2O. Total resistances (tR) on basal state were 25 ± 7 cmH_2O/l/s, those decreased to 22 ± 7 (13 ± 9%),after adding PEEP the value of tR was 20 ± 6 cmH_2O/l/s and decreased to 16 ± 6 cmH_2O/l/s (22 ± 15%). Those changes were not statistically significant ($p = 0.2$) and showed a wide variability between patients.

CONCLUSIONS. In a basal state the effect of salbutamol on resistances is similar to that previously known (15%). With the limitation of the number of patients included, our data reflects that in some cases mechanical ventilation with PEEP has bronchodilator effect "per se" and increase the action of bronchodilators.

0484

MECHANICAL VENTILATION IN LIFE-THREATENING ASTHMA

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RATIONALE. Little is known about real-world mechanical ventilation (MV) practices for patients with life-threatening asthma. We used data from two international prospective utilisation reviews to determine: (1) the characteristics, ventilatory practices, and outcomes of these patients; (2) whether practice had changed over time; and (3) whether asthmatics are ventilated differently than other patients.

METHODS. We performed a secondary analysis of data from 10,051 patients who received MV for more than 12 h and were enrolled in two international observational studies conducted in 1998 and 2004. Patients were followed prospectively for the duration of ventilation. We analysed patients whose primary indication to begin MV was asthma; comparing them to each other between 1998 and 2004, and to patients with other causes of acute respiratory failure.

RESULTS. Comparing asthmatics from 1998 ($n = 79$) to those from 2004 ($n = 63$), the mean (SD) baseline characteristics [Age 51 (18) vs. 49 (16), $p = 0.47$; female sex 63 vs. 51%, $p = 0.09$; SAPS II 35 (13) vs. 34 (17) $p = 0.72$] were similar in both cohorts. Choice of MV mode [CMV 71 vs. 59%, $p = 0.93$], and those with tidal volume <8 ml/kg ABW (61 vs. 70%, $p = 0.26$) or ZEEP (76 vs. 65%, $p = 0.16$) were also unchanged. Barotrauma (6.3 vs. 4.8%, $p = 0.49$), and outcomes [duration of MV 5.1(6.1) vs. 4.0 (4.6) days, $p = 0.23$; ICU LOS 7.0 vs. 6.2 days, $p = 0.56$; ICU mortality 11.4 vs. 9.5%, $p = 0.44$] were similar between 1998 and 2004. Comparing all asthmatics with patients ventilated for other conditions, asthmatics were significantly younger [51 (17) vs. 59 (17) years, $p < 0.001$], were predominantly women (58 vs. 39%, $p < 0.001$), and had lower SAPS II scores [35 (15) vs. 44 (17), $p < 0.001$). More asthmatics received CMV as the initial mode of MV (65 vs. 52%, $p = 0.004$], and more were paralysed (25 vs. 12%, $p < 0.001$). The proportion of patients receiving tidal volumes below 8 ml/kg ABW (65 vs. 41%) or ZEEP (71 vs. 35%) was higher in asthmatics ($p < 0.001$ for both). Peek pressures were higher in asthmatics [35 (13) vs. 28 (8), $p < 0.001$], while plateau pressures were similar [23 (8) vs. 21 (5), $p = 0.92$]. Mean $PaCO_2$ was higher in asthmatics [52 (17) vs. 40 (12), $p < 0.001$]. Rates of barotrauma were similar (6 vs. 4%, $p = 0.16$) but complications of ALI or sepsis were less frequent in asthmatics. Duration of ventilation [4.3 (4) vs. 6.0 (7)], ICU LOS [7.6 (8) vs. 11.5 (13)], and ICU mortality (11 vs. 31%) were all significantly lower in asthmatics ($p < 0.001$ for all).

CONCLUSIONS. MV practices did not change significantly in asthmatics from 1998 to 2004. In asthmatics there were significantly different MV parameters compared with other causes of respiratory failure, and they had significantly better outcomes.

0485

INFLUENCE OF INSPIRED OXYGEN CONCENTRATION ON ARTERIAL PARTIAL PRESSURE OF CARBON DIOXIDE DURING NONINVASIVE VENTILATION IN PATIENTS WITH ACUTE EXACERBATION OF COPD

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INTRODUCTION. The administration of a high fraction of inspired oxygen concentration (FIO_2) to chronic obstructive pulmonary disease (COPD) patients breathing spontaneously may result in hypercapnia; this fact may be due to the reversal of preexisting regional hypoxic pulmonary vasoconstriction resulting in a greater dead space. To date this issue was not studied during noninvasive ventilation (NIV).

OBJECTIVE. To investigate the response of the arterial partial pressure of carbon dioxide ($PaCO_2$) to a high inspired FIO_2 during NIV.

METHODS. Experimental prospective study in an 18-bed medical-ICU in a university teaching hospital.

MEASUREMENTS AND MAIN RESULTS. Seventeen NIV-ventilated CO_2-retaining COPD patients were studied both at their baseline FIO_2 (0.25–0.50), and following a 40 minutes period of exposure to an FIO_2 of 1.0. No other parameter was changed. Following 40 minutes at an FIO_2 of 1.0, the V_T, RR, V_E, ABG, and SaO_2 were again recorded, as well as changes in mental status (evaluating Glasgow coma score [GCS]). The patients were then returned to their baseline FIO_2. They were not aware of the changes made to their FIO_2. Mean (±SD) baseline findings were: PaO_2 of 101.4 ± 21.7 mmHg, $PaCO_2$ of 52.6 ± 10.4 mmHg, respiratory rate (RR) of 17.8 ± 3.7 breaths/min, tidal volume (V_T) of 601 ± 8 mL, and Glasgow coma scale (GCS) of 14.8 ± 0.3. Statistical analysis using the paired Student's *t* test showed that the PaO_2 (290.5 ± 35.7 mmHg; $p < 0.001$) increased significantly when the FIO_2 was increased to 1.0, but there was no significant change in $PaCO_2$ (51.5 ± 12.3 mmHg), RR (17.5 ± 2.8 breaths/min), V_T (608 ± 8 mL) and GCS (14.8 ± 0.3).

CONCLUSION. These results show that during noninvasive ventilation with an FIO_2 sufficient to maintain a normal PaO_2, a further increase in FIO_2 for forty minutes does not result in an increased $PaCO_2$ in this group of CO_2-retaining COPD patients.

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0486

NON-INVASIVE VENTILATION—A ONE YEAR COHORT STUDY COMPARED TO A PREVIOUS COHORT STUDY IN AN ICU

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INTRODUCTION. Non-invasive ventilation (NIV) has been used increasingly for more than 20 years, but little is known about outcome when used extensively on daily basis in an ICU.

OBJECTIVE. To compare NIV-treatment in a 2007 cohort with a 2002/2003 cohort regarding patient characteristics, procedures and outcome. In the 2007 cohort arterial blood gasses were analyzed, in order to evaluate if it was possible to treat patients with pH below 7.25 with NIV.

METHOD. Prospective, consecutive, strictly observational cohort study of all patients treated with NIV without any specific interventions.

RESULTS. 142 patients in 2007 were compared to 100 patients in 2003 and 58 patients in 2002. There were eight different diagnostic groups: COPD, cardiac disease, pneumonia, postoperative, septicemia, intoxication, cancer, and others. There were no difference in patient categories with regard to admission diagnosis during the study periods.

Hours of NIV-treatment decreased each year (from 22 to 15 to 14).

Hours in ICU decreased significantly (from 92 in 2002 to 40 in 2003 to 49 in 2007).

APACHE-score increased each year significantly (from 19.4 to 20.1 to 21.8).

Median age of patients each year were not different, but the proportion of patients older than 79 years increased each year (from 16 to 24 to 25%).

When NIV failed time-to-intubation decreased each year (from 19.5 to 7 to 5.3 h) and at the same time surviving rate increased each year (from 33 to 52 to 57%).

Overall mortality rates during the 3 years were 31, 41 and 39%, respectively.

Arterial blood gases were evaluated only in the 2007 cohort. Out of 81 patients with a pH < 7.25, there were 59 patients only treated with NIV and 42 (71%) survived. Out of 58 patients with a pH > 7.24 there were 44 patients only treated with NIV and 27 (61%) survived.

CONCLUSIONS.

1. With increased experience in treating NIV-patients we found that:
   - we were able to decrease hours of NIV-treatment and time in the ICU
   - we were able to treat more patients older than 79 years with unchanged mortality rate
   - we were able to treat patients with higher APACHE-scores with unchanged mortality rate
   - the staff reacted faster when NIV failed and intubated the patients, and when intubated faster surviving rate increased
2. In the 2007 cohort we found that in patients treated exclusively with NIV, the surviving rate was greater for patients with a pH below 7.25, as compared to patients with a pH above 7.24.

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0487

COMPARATIVE EVALUATION OF A NEW HELMET FOR DELIVERING NONINVASIVE VENTILATION (NIV)

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INTRODUCTION. NIV is an effective means to provide ventilatory assistance to patients with acute respiratory failure (ARF) of various aetiology. Compared to the facial mask (FM), which is the gold standard, the helmet is an alternative interface that allows longer periods of continuous NIV. On the one hand, the helmet eliminates the risk of facial skin breakdown by removing the need for sealing around the nose and the mouth, but exposes the patient to the risk of bruises under the armpits because of the anchoring braces. On the other hand, in contrast to FM, it remarkably deteriorates patient-ventilator interaction (PVI), because of the soft wall and the cranio-caudal oscillation of its soft collar. We thus designed a new helmet aimed to improve PVI, by reducing the inspiratory trigger delay ($Delay_{trinsp}$) and increasing the rate of airway pressurization, while eliminating the need for the armpit braces.

OBJECTIVES. Purpose of this bench study is to evaluate the performance of this new helmet (NH) in delivering NIV, compared to the standard helmet (SH) and the FM.

METHODS. The three interfaces were tested on a mannequin connected to a lung model at respiratory rates of 20 (RR_{20}) and 30 (RR_{30}) breaths/min. NIV was applied through a mechanical ventilator set in pressure support (PS) with positive end-expiratory pressure of 8 cmH_2O and inspiratory support of 12 cmH_2O. Inspiratory trigger delay ($Delay_{trinsp}$), pressure-time product 300 and 500 ms after the onset of the inspiratory effort (PTP_{300} and PTP_{500}, respectively), and pressure–time product 200 ms after the onset of ventilator assistance (PTP_{200}) were determined.

RESULTS. $Delay_{trinsp}$ were 0.14, 0.11 and 0.08 ms at RR_{20}, and 0.17, 0.13 and 0.09 ms at RR_{30}, for SH, NH, and FM, respectively. NH resulted to be significantly different ($p < 0.05$), compared to either SH and FM, at both RR_{20} and RR_{30}.

PTP_{300} values for NH (1.08 and 0.85 cmH_2O/s at RR_{20} and RR_{30}, respectively) were significantly ($p < 0.001$) higher than for SH (0.8 and 0.27 cmH_2O/s at RR_{20} and RR_{30}, respectively), and lower than for FM (1.66 and 1.62 cmH_2O/s at RR_{20} and RR_{30}, respectively).

PTP_{500} values for NH (3.21 and 2.70 cmH_2O/s at RR_{20} and RR_{30}, respectively) were significantly ($p < 0.05$) higher than for SH (3.04 and 2.48 cmH_2O/s at RR_{20} and RR_{30}, respectively), and lower than for FM (3.67 and 3.78 cmH_2O/s at RR_{20} and RR_{30}, respectively).

PTP_{200} values for NH (0.90 and 0.85 cmH_2O/s at RR_{20} and RR_{30}, respectively) were significantly ($p < 0.001$) higher than for SH (0.61 and 0.57 cmH_2O/s at RR_{20} and RR_{30}, respectively), and lower than for FM (1.31 and 1.40 cmH_2O/s at RR_{20} and RR_{30}, respectively).

CONCLUSIONS. Although less efficient than FM, compared to SH, NH significantly improved PVI, while eliminating the need for the armpit braces.

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CLINICAL PERFORMANCE OF NON-INVASIVE VENTILATION (NIV) MODES ON ICU VENTILATORS DURING PRESSURE SUPPORT : PRELIMINARY RESULTS

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INTRODUCTION. 43% of patients undergoing NIV exhibit severe asynchrony, mainly associated with leaks [1]. Specific NIV modes to decrease the impact of leaks have been designed, but remain untested in clinical conditions.

PURPOSE. To evaluate in the clinical setting the effect of NIV modes on the incidence and severity of asynchrony.

METHOD. Prospective multicenter observational study of pts. with ARF receiving clinician-set pressure support NIV. Two 30 min periods of continuous recordings were performed, without (NIV0) and with (NIV+) NIV mode. Respiratory rate, pt. neural inspiratory time (tin), duration of ventilator pressurisation (tiv), excess pressurization duration (tiexcess = tiv − tin/tin × 100), *n* asynchrony events (AE) and Asynchrony Index [AI = *n* asynchrony events/(triggered + non-triggered breaths)] were measured. Results are given in mean ± SD. *p* is considered significant if <0.05.

RESULTS. (mean ± SD): 10 pts (4F/6 M); age = 66 ± 16 years; BMI = 27.3 ± 5.3 kg m^{-2}, PSL = 12.5 ± 3.7 cmH_2O, PEEP = 6.8 ± 1.8 cmH_2O. Table 1, 4 patients without NIV mode had an AI > 10%. No patient with NIV mode had severe asynchrony (Table 2)

TABLE 1

Parameters	NIV0	NIV+
Leaks (L/min)	4.4 ± 3	3 ± 2 *
VTe (ml)	660 ± 241	712 ± 214
Respiratory rate (*n*/min)	22.4 ± 4.4	22.3 ± 4.5
Tin (s)	793 ± 120	808 ± 144
Tiexcess (s)	34.5 ± 8.0	23.7 ± 9.0 *

* $p = 0.05$ versus NIV0

TABLE 1

Asynchronies	NIV0	NIV+
Double triggering (*n*/min)	0.2 ± 0.3	0.1 ± 0.01
Auto-triggering (*n*/min)	0.4 ± 0.2	0.2 ± 0.2*
Non-triggered breaths (*n*/min)	0.14 ± 0.1	0.07 ± 0.1*
Premature cycling (*n*/min)	0.05 ± 0.04	0.2 ± 0.27
Delayed cycling (*n*/min)	2.4 ± 0.5	0.2 ± 0.2*
Asynchrony index (%)	14.2 ± 5	3 ± 2.3*

* $p = 0.05$ versus NIV0

CONCLUSION. During NIV with leaks, asynchronies can be partly corrected by NIV mode, mainly delayed cycling and auto-triggering. The present ongoing trial should provide further insight as to the clinical relevance of specific NIV modes in patients with ARF.

1) Vignaux et al (2009) Intensive Care Med 2009. doi:10.1007/s00134-009-1416-5

0489

NON INVASIVE MECHANICAL VENTILATION (NIMV) USE IN RESPIRATORY FAILURE AFTER EXTUBATION—PRELIMINARY RESULTS

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OBJECTIVES. Our aim has been to assess the benefit of the use of NIMV in patients with respiratory failure appeared after removing tracheal intubation.

PATIENTS AND METHODS. Since December 2007 to October 2008 we analyzed 70 patients undergoing mechanical ventilation (MV) for more than 24 h and admitted in a 19 bed medical/surgical ICU in a university hospital. Patients with neurological disease or COPD were not included (because of the argued added benefit of NIMV in this group). We identified those patients who developed respiratory failure during the 48 immediate hours after extubation.

Type of study. Randomized comparison of treatment with conventional oxygen therapy versus NIMV.

Analyzed variables. Reduction of the reintubated number of cases, incidence of nosocomial infection, ICU length of stay, and need for tracheotomy. Statistical analysis was performed using SPSS 12.0, with a significance level of $p < 0.05$.

RESULTS. Out of the 70 patients included in the study, 15 patients (21%) failed after extubation. Two of them required urgent intubation due to decreased level of consciousness. Of the remaining 13, 8 were randomized to NIMV and 5 to oxygen (control group). The comparison between the NIMV and the control group only showed differences in the values of bicarbonate (26 vs. 23 meq/l, $p = 0.03$). There was a lower rate of reintubation in NIMV group (2 vs. 5, $p = 0.028$), incidence of nosocomial pneumonia and mortality were similar. The average stay was higher in the oxygen group (18 vs. 11 days, $p = 0.21$).

CONCLUSION. Our preliminary results on respiratory failure after removing OT tube show a satisfactory result in the use of NIMV with less need for reintubation and shorter stay in ICU than in the control group, but with very similar mortality rates.

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NON-INVASIVE VENTILATION IN ACUTE CARE - EXPERIENCE IN AN INDIAN ICU

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INTRODUCTION. Acute hypoxic respiratory failure with ALI/ARDS is a common accompaniment of many illnesses, such as pancreatitis, sepsis, trauma, in an ICU.

There is growing evidence that, besides the traditional use of non-invasive ventilation (NIV) in COPD, it is equally efficacious in hypoxic respiratory failure when used early. It improves the PO_2 and optimises the PO_2/FiO_2 ratio in this group of patients. The prospective study was done to evaluate the efficacy of non-invasive ventilation (NIV) in acute hypoxic respiratory failure in ICU in developing countries like India.

METHODS. 50 adult patients of both sexes admitted in ICU over a period of 1 year, requiring respiratory support were studied. NIV was initiated using a bilevel ventilator (Knight Star 330, PB) with O_2 supplementation @ 4–6 lpm. Haemodynamic and respiratory monitoring (invasive and noninvasive) was done. Patients who were obtunded, haemodynamically unstable or having facial injuries or bilateral chest trauma were excluded. NIV was discontinued when PO_2/FiO_2 was >300 mmHg or when there was failure of NIV (due to non improvement). Statistical analysis was done using Wilcoxon Signed Ranks Test and Chi-Square Test.

RESULTS. 40 males and 10 females, mean (±SD) age 38 ± 16 were studied. Patient population comprised of unilateral # ribs (40%), pancreatitis (34%), pneumonitis (16%), fat embolism (8%) and postoperative respiratory failure (2%). Mean length of stay on NIV was 4.61 ± 0.5 days. Mean length of stay in ICU was 8 ± 2 days. Mean PO_2 on initiation of NIV was 65 ± 5 mmHg and on termination was 154 ± 12 mmHg ($p < 0.001$, significant). Mean PO_2/FiO_2 on initiation of NIV was 129 ± 15 mmHg and on termination improved to 319 ± 8 mmHg, which was significant ($p < 0.001$). 4 out of 50 patients required intubation and invasive ventilation which was not significant ($p > 0.05$). 46 out of 50 patients could easily be managed on NIV ($p < 0.001$).

CONCLUSIONS. Early and judicious use of non-invasive ventilation in selected patients with ALI/ARDS is an efficient alternative in ICU settings in the third world countries. Patients with haemodynamic instability and extensive bilateral chest injuries are exception.

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NON-INVASIVE VENTILATION IN THE POST-ANESTHESIA CARE UNIT FOR POST-OPERATIVE RESPIRATORY FAILURE: PROSPECTIVE ANALYSIS OF 14 CASES

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INTRODUCTION. Non-invasive ventilation (NIV) has become an effective treatment to reduce morbidity and mortality in patients with acute respiratory failure. Its application has been restricted to critical care o intermediate care areas, and little data is available on its usefulness in the post-anaesthesia care units (PACU). The aim of this study is to evaluate the effectiveness of NIV after implementing a treatment protocol.

METHODS. We undertook a prospective analysis of patients treated with NIV between September 2008 and February 2009. The need for NIV was established in the recovery room, if patients met the following criteria: hypoxemia with arterial partial pressure of oxygen/inspired oxygen fraction ratio (PaO_2/FIO_2) <300, and/or arterial partial pressure of carbon dioxide ($PaCO_2$) >50 mmHg. Data of age, ASA physical status, surgical procedure, anaesthesia modality, type of respiratory failure, ventilatory mode, side effects related to NIV application, and time of NIV were recorded. We also recorded arterial blood gas analysis at two points: (1) before NIV and (2) after discontinuation of NIV. Descriptive statistical analysis was used. Data are presented as means and standard deviations (SD). Comparison of variables was performed with paired sample t test. Statistical significance was assumed at $P = 0.05$.

RESULTS. Fourteen patients were included. The mean age was 67 ± 14 (SD) years. Seven patients were classified as ASA 2 (50%), six as ASA 3 (42.9%), and one as ASA 4 (7.1%). General and regional anaesthesia were employed in 13 and 1 cases, respectively. Type of surgery was abdominal (56.1), thoracic (21.4%), vascular (14.3), and urologic (7.1). Type of respiratory failure was hypoxemic (43%), hypercapnic (21.3%), and global (35.7%). Ventilatory mode was BIPAP (50%), and CPAP (50%). The mean time of NIV was 75.37 ± 20.78 (SD) min. PaO_2/FiO_2 was significantly higher after NIV compared with basal data (143.62 ± 63.27 vs. 253.90 ± 88.69; $P = 0.01$). $PaCO_2$ values were significantly lower after NIV (52.77 ± 9.54 vs. 45.62 ± 6.71 mm Hg; $P = 0.01$). No complications related to NIV occurred. Although two patients were transferred to de ICU, no patient required intubation. The rest of them were transferred to the surgical wards the same day.

CONCLUSIONS. NIV can be safely applied to selected patients in the PACU, to treat respiratory failure after either general or regional anaesthesia. It improves gas exchange and is an effective method to avoid intubation and ICU stays, with minimal side effects.

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WHEN THE NON INVASIVE VENTILATION FAILS

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OBJECTIVES. To evaluate the influence of the non invasive ventilation (NIV) failure on a heterogeneous sample of critically ill patients.

METHODS. Sub-analysis from an observational, prospective, multicenter, cohort study carried out in thirteen Spanish ICU during 2 years. Inclusion criteria: adult critically ill patients mechanically ventilated more than 24 h. Exclusion criteria: patients <18 years old and thermally injured patients.

RESULTS. One thousand forty-nine critical medical patients mechanically ventilated more than 24 h were recruited. One hundred seventy-five patients received NIV during (median) 12 h (r: 1–216) whose failure led to endothracheal intubation and invasive mechanical ventilation (IMV). Diagnosis and results are showed in the Tables 1, 2 and 3.

TABLE 1 ADMISSION DIAGNOSIS

Diagnosis	IMVafter NIV failure ($N = 175$)	IMV without NIV ($N = 874$)
Pneumonia	72 (41.2%)	150 (17.2%)
COPD	30 (17.1%)	75 (8.6%)
Sepsis	11 (6.2%)	94 (10.8%)
Pancreatitis	6 (3.4%)	16 (1.8%)
ALI/ARDS	10 (5.7%)	13 (1.5%)

Admission diagnosis

TABLE 2 ADMISSION DIAGNOSIS

Diagnosis	IMVafter NIV failure ($N = 175$)	IMV without NIV ($N = 874$)
ACS	2 (1.1%)	6 (0.7%)
Heart failure	12 (6.9%)	42 (4.8%)
Cardiogenic shock	8 (4.6%)	22 (2.5%)
Stroke	4 (2.4%)	102 (11.7%)
Other	20 (11.4%)	354 (40.5%)

Admission diagnosis

TABLE 3 RESULTS

	IMV after NIV failure ($N = 175$)	IMV without previous NIV ($N = 874$)	p
Age	63.3 ± 13.7	62.3 ± 15.3	0.3
APACHE II	21.8 ± 7.03	21.4 ± 7.6	0.4
SOFA respiratory	3.25 ± 0.85	2.7 ± 1.07	0.000
SOFA Glasgow	0.88 ± 1.1	1.8 ± 1.5	0.000
Total SOFA	8.3 ± 3.3	8.8 ± 3.5	0.04
IMV (days)	15.8 ± 15	12.3 ± 15.3	0.005
Tracheostomy	59 (33.7%)	216 (24.7%)	0.03
UCI mortality	63 (36%)	240 (27.5%)	0.02

CONCLUSIONS. NIV failure leads to: (1) A delayed endothracheal intubation. (2) Longer duration of IMV. (3) Higher mortality in ICU. Therefore, we should be strict whit this technique and its use should be restricted to those pathologies where clear benefits have been demonstrated.

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PREDICTING FAILURE OF NON-INVASIVE VENTILATION: AN ASSESSMENT OF THE USEFULNESS OF POTENTIAL PREDICTORS IN A UK TEACHING HOSPITAL POPULATION

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INTRODUCTION. Non-invasive ventilation (NIV) has many potential benefits, however, careful patient selection and monitoring are important to its success. Many factors have been related to NIV failure (either due to intubation or death). These include age, ARDS, pneumonia, a non-COPD background, high illness severity, low GCS, low pH, high $PaCO_2$, hypoxia, high respiratory rate and hypotension.

OBJECTIVES. This retrospective study aimed to assess the applicability of potential predictors of NIV failure to a standard mixed ICU population and to quantify the influence of each of these factors by means of odds ratios.

METHODS. In a large UK teaching hospital all patients who had received NIV in the ICU over 1 year (April 2007–April 2008) were retrospectively reviewed. Their diagnoses, potential predictors, NIV use and success or failure were recorded. Predictors were examined overall and separately in COPD and non-COPD patient groups.

RESULTS. Ninety-eight patients initiated a trial of NIV on the ICU in 1 year. Of these 55% were successful, 28% resulted in intubation and 17% of patients died without intubation. Survival was 80% to ICU and 72% to hospital discharge. The main diagnoses were 'chest infection' (42%), pneumonia (19%) and pulmonary oedema/heart failure (18%). COPD was a factor in 33% of patients. Extubation failure was a reason for NIV in 20% of patients. Surgical patients made up 21% of the total.

Factors associated with failure were a non-COPD diagnosis (OR 5.53), age >40 (OR 6.13), hypotension (OR 5.00), immune suppression (OR 2.48), pneumonia (OR 1.70) and extubation failure (OR 1.76). Factors associated with success were surgical (vs. medical) conditions (OR 0.37) and pulmonary oedema/heart failure (OR 0.33). In the COPD group (81% success with NIV) no factors strongly predicted failure. In the non-COPD group (44% success with NIV) failure was associated with age >40 (OR 7.5), hypotension (OR 2.80) and immune suppression (OR 3.15). Success was associated with pulmonary oedema/heart failure (OR 0.38) and surgical conditions (OR 0.37).

CONCLUSIONS. In this mixed group of patients NIV failure was associated with: age >40, diagnoses other than COPD or pulmonary oedema/heart failure, hypotension, immune suppression, medical conditions, extubation failure and pneumonia. Therefore, NIV use in these patients needs to be considered carefully.

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0494

EFFECTS OF NON-INVASIVE MECHANICAL VENTILATION ON HEMODYNAMICS AND GAS EXCHANGES PARAMETERS AFTER CARDIAC SURGERY IN PATIENTS WITH RELATIVE HYPOXEMIA

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INTRODUCTION. Non-invasive mechanical ventilation (NIV) has been used in hypoxic post-operative cardiac patients but more studies are necessary to clarify its respiratory and hemodynamic effects. Therefore, our objective was to study its effects in the oxygenation index (PaO_2/FiO_2) and in hemodynamic variables in this group of patients.

METHODS. This is a randomized trial in which all post-operative cardiac patients since April 2008, having a Swan–Ganz catheter and showing a PaO_2/FiO_2 between 150 and 300 (with FIO_2 0.31), 1 h after extubation, were included. Intervention group used NIV with a bi-level positive airway pressure (an inspiratory pressure to generate a tidal volume of 6 ml/kg and an expiratory pressure of 7cmH_2O) with a FIO_2 0.4. Control group used oxygen by Venturi mask in order to keep a good oxygenation. In both groups measurements were done in basal situation and 1 h after beginning the treatment. Variables studied included: PaO_2/FiO_2, PaO_2, heart rate (HR), mean arterial pressure (MAP), pulmonary capillary wedge pressure (PCWP) and cardiac output (CO) (Table 1)

TABLE 1 GAS EXCHANGE AND HEMODYNAMIC PARAMETERS (*$P<0.05$)

	Control group ($n = 19$; mean age 63.6 ± 9.5)			NIV group ($n = 17$; ean age 70.4 ± 7.4)		
	Basal	1 h	*p*	Basal	1 h	*p*
PaO_2/FIO_2	245.7 ± 28.7	235.1 ± 45.2	0.320	252.2 ± 29.8	292.3 ± 55.5*	0.012
PaO_2	77.2 ± 8.1	96.2 ± 17.2	<0.001	79.3 ± 8	118.1 ± 20.5*	<0.001
HR	90.8 ± 12.3	93 ± 9.9	0.221	85.2 ± 12.3	82.2 ± 14.1*	0.146
MAP	77.6 ± 8.5	80.6 ± 7.8	0.288	81.4 ± 12.3	82.8 ± 11	0.583
PCWP	11.3 ± 4.9	11.1 ± 5.7	0.686	9.1 ± 4.1	10.9 ± 4.1	<0.001
CO	5.5 ± 1.7	5.6 ± 1.9	0.772	4.6 ± 1.9	4.4 ± 1.3*	0.268

RESULTS. Until now, 36 patients were included (20 male and 16 female). The most important results are shown in the table below.

CONCLUSIONS. These preliminary results showed that NIV with bi-level pressure improves oxygenation without significant hemodynamic changes, except a small increase in PCWP and a trend to decrease in HR.

Poster Sessions
General perioperative care: 0495–0508

0495

THE USE OF INDOCYANINE GREEN IN THE EVALUATION OF HEPATIC FUNCTION BEFORE AND AFTER HEPATIC RESECTION SURGERY

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INTRODUCTION. Inadequate functional reserve of the remaining hepatic parenchyma after surgical resection, is associated with progression of liver failure. A non-invasive liver function monitoring system, the LiMON® (Pulsion) has been developed to measure indocyanine green (ICG) elimination by pulse spectrophotometry. The ICG retention rate at 15 min (R15) and ICG plasma disappearance rate (PDR) have both been used as predictors of postoperative liver failure and mortality, in particular in patients with mild to moderate liver dysfunction prior to surgery.The aim of this study is to evaluate the use of this method in patients submitted to hepatic resection and admitted to the ICU.

METHODS. From July 2008 to March 2009, we evaluated 21 patients that have been submitted to hepatic resection surgery and have been admitted to the ICU postoperatively. The administration of ICG in a dose weight-adjusted was performed before and after the surgery (1–2nd day). ICGPDR and ICGR15 were measured and their values were registered.

RESULTS. From the 21 patients, 6 were excluded from analysis due to incomplete information. 15 patients were evaluated, mostly female (11 vs. 4), with a mean age of 57.5 years. The majority (10 patients) had liver metastasis secondary to breast cancer or from gastrointestinal tract cancer, 2 patients had a primary neoplasm of the liver and the others had benign disease (cysts, adenoma). The assessment of liver function by the conventional tests (total bilirubin, albumin, INR) was within the normal range or presented just slightly changes. All patients were included in the Child-Pugh Class A. In the group of patients with secondary liver cancer, 2 had ICG values outside the normal range. One patient with low PDR (14.4%/min) and high R15 (11.5%) preoperatively and with postoperative normalization of the value of R15. Another patient with only PDR altered preoperatively (16.5%/min) that normalised in the post-surgery determination. These two patients had 70 and 74 years old and both had rectum cancer, with previous removal of the primary location and liver metastasis.In the group of patients with primary tumour of the liver and with benign disease the values of PDR and R15 were within normal limits. All patients were discharged alive from the hospital.

CONCLUSIONS. ICG PDR and R15 measured by pulse spectrophotometry is a quick, non-invasive and reliable liver function test that helps the surgeon to estimate liver reserve and to plan the surgery according to this data. The performance of hepatic surgery, monitored in the pre-operative stage by this technique, presented a good outcome in this group of patients.

0496

LIVER TRANSPLANTATION WITH GRAFTS FROM DONOR ASISTOLIA VERSUS DONOR BRAIN DEATH—PRELIMINARY RESULTS

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INTRODUCTION. The possibility of using donor liver grafts asistolia (DA) increases the availability of organs for liver transplantation (WR). In donor asistolia there may be an increase in the immediate postoperative complications of graft preservation injury and subsequent dysfunction of the same.

OBJECTIVE. To evaluate differences in the immediate postoperative period with grafts from DA (TXHDA) compared to donor brain death (DME) (TxHDME).

MATERIAL AND METHODS. A prospective case-control in adult patients with WR. Study period: 3 years. Patients were divided into two groups according to type of graft: The study group: TxHDA; Control group: TxHDME. Both were treated with the same protocol. We analyzed parameters of the postoperative donor and recipient. Statistical analysis was performed with SPSSv11.

RESULTS. We included 54 patients: TxHDME: 26; TxHDA: 28. The DA had the highest figures of cytolysis, amylase, rhabdomyolysis, metabolic acidosis and hyperglycemia that DME. There were differences in the severity of Child-Pugh (C 42 vs. 53.6%, B 32.1 vs. 50%, 8 vs. 14.3%) and MELD 14 ± 4.7 pre-WR. The mean age was higher TxHDA (56.63 ± 9.42 vs. 52 ± 11 years). There was no difference in ischemic stroke. The incidence of immediate postoperative complications in the ICU was higher in group TxHDA (69.94% vs. 55%). A greater incidence of reperfusion syndrome (78.57 vs. 31%), graft dysfunction (35.7 vs. 15%) and degree of coagulopathy during the first 72 h post-WR in TxHDA. TxHDA Six patients required retransplantation and none TxHDME. The ICU and hospital stay was also higher in TxHDA 7.09 ± 4.11 versus 10.74 ± 4.63 days and 21.94 ± 19.77 versus 20.43 ± 11.12 days, respectively. In this group the mortality in the ICU was 17.86%. No patient died in TxHDME.

CONCLUSIONS.

1. TxHDA the higher incidence of reperfusion syndrome, graft dysfunction and that the coagulopathy TxHDME, indicating greater amount of blood during surgery and the postoperative period.
2. TxHDA the higher incidence of immediate postoperative complications
3. There is increased hospital mortality in group TxHDA related characteristics of recipients and graft.
4. The data should be confirmed with more cases.

0497

BLOOD LACTATE AND APACHE IIAND MODS SCORE IN SEVERE SEPSIS WITH LIVER TRANSPLANTATION

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OBJECTIVES. Lactate levels are a useful tool in monitoring septic patients. However, blood lactate levels often changes when liver dysfunction. The prognostic significance of blood lactate in severe sepsis with or without orthotopic liver transplantation (OLT) was investigated in this study.

METHODS. 30 septic patients in non-OLT group and 26 septic patients in OLT group. Blood lactate and APACHE II and MODS score were checked in 1, 3 and 7 day, respectively.

RESULTS. There was significant difference in 28 days survival rate between non-OLT group and OLT group (70 vs.43.4%, $P < 0.05$) and blood lactate in 1 day (2.1 ± 1.1 vs. 6.1 ± 2.1 mmol/L, $P < 0.05$). Blood lactate in OLT group was constant higher than that in non-OLT group in 7 day (2.9 ± 1.6 vs.1.5 ± 1.1 mmol/L, $P < 0.05$). The MODS score in OLT group was higher than that in non-OLT group in 7 day (7.1 ± 2.9 vs.11.1 ± 3.4, $P < 0.05$), but not in APACHE II.

CONCLUSIONS. Failure to improve blood lactate in 1 day is a strong predictor of mortality in severe sepsis patients with liver transplantation. To assess failure organs in severe sepsis patients with liver transplantation, MODS score is better than APACHE II.

KEYWORDS: Orthotopic liver transplantation (OLT); Sepsis; Blood lactate

0498

CORRELATION BETWEEN ELECTROCARDIOGRAPHY SIGNS OF MYOCARDIAL ISCHEMIA AND VALUES OF CARDIO SPECIFIC ENZYMES

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OBJECTIVE. Diagnosis of perioperative myocardial infarction after cardiosurgical procedures rely on a combination of electrocardiography (ECG) changes and postoperative values of cardio specific enzymes. As in this conditions myocardial ischemia is the most often global, ECG changes are unspecific. In this study we correlate ECG changes with the values of cardio specific enzymes.

METHODS. In the study were enrolled 112 patients scheduled for elective aorto-coronary bypass or heart valve surgery. ECG was recorded preoperatively and the first postoperative day and the presence of ischemic changes were followed. Criteria of myocardial damage were: new appearance of Q wave, ST elevation more than 0.2 mV and ST depression more than 0.1 mV. Values of cardiac troponin I (cTnI) were measured before the operation, 6 and 24 h after the operation. Incidence of ECG changes were correlated with values of cTnI. Data were analyzed using Mann–Whitney U test and Wilcoxon test.

RESULTS. Presence of ECG ischemic changes did not represent statistically significant correlation with the postoperative values of cTnI.

CONCLUSION. As the presence of ischemic ECG changes after elective cardio surgical procedures did not correlates with the values of cTnI it can be concluded that after extracorporeal circulation ECG is not specific marker of myocardial ischemia. In this conditions ischemia is the most often global, and the clinicians can not rely just on ECG changes in the diagnosis of perioperative myocardial infarction.

0499

CENTRAL VENOUS OXYGEN SATURATION VALUES ARE RELATED TO THE NUMBER OF COMPLICATIONS IN POSTOPERATIVE PATIENTS

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INTRODUCTION AND OBJECTIVES. Several studies have stablished the use of central venous oxygen saturation values as a guide for the treatment in critically ill patients [1, 2].

The aim of our study has been to analyze the relationship between the central venous oxygen saturation ($ScvO_2$) values and the number of complications in postoperative abdominal surgical patients.

MATERIAL AND METHODS. $ScvO_2$ were assesed every 4 h since the patients get into the Unit and during the first 24 h from the central lines of 307 postoperative patients. We included ASA I–IV patients who were sent to the Critical Care Unit (33.5% females, 66.5% males). Complications in the Critical Care Unit were registered. A t Student test for non-dependent samples with a type error of 5% was used.

RESULTS. The mean value of $ScvO_2$ was the only one related with the number of complications in the Critical Care Unit. Data ($ScvO_2$ values in patients with 1, 2 or ≥ 3 complications) are shown in the Graph.

CONCLUSIONS. Patients with higher number of complications (≥ 3 complications) in the Critical Care Unit had lower $ScvO_2$ values than those with less number of complications.

Mean $ScvO_2$ and number of complications

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0500

ADMINISTRATION OF HIGH-DOSE TRANEXAMIC ACID IN OPEN HEART PROCEDURES MIGHT BE ASSOCIATED WITH INCREASED RISK OF DEATH

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AIMS. Antifibrinolytic agents are commonly used during cardiac surgery to minimize bleeding. In 2006, retrospective data from the Mc SPI database seemed to show that the use of aprotinin was associated with an increased risk of complications after cardiac surgery and even with an increased mortality [1, 2]. In 2007 data from the BART trial was published [3], showing a higher rate of deaths in patients receiving aprotinin. In 2008 data from a retrospective study liked the use of tranexamic acid (TXA) to an increased rate of seizures after open heart procedures [4].

So still the question about safety of aprotinin and TXA is not solved. Therefore, the aim of this study was to evaluate the efficiency and the safety profile of TXA compared to aprotinin in open heart procedures by this prospective observatory study.

METHODS. After publication of the first Mangano paper raising concerns about the safety profile of aprotinin we changed our routine adminstration of antifibrinolytics to 50 mg/kg TXA prior CPB and 50 mg/kg into the priming fluid of the CPB. Prior to this paper all patients received aprotinin after sternotomy in a dose of 1.5×10^6 KIU. After consent for this retrospective observatory study we included 320 consecutive patients undergoing open heart procedures (105 receiving TXA and 215 receiving aprotinin) into our final analysis. Efficiency was evaluated by the need for transfusion of blood products and total postoperative blood loss. Safety was evaluated by mortality, routinely monitored biomarkers and the diagnosis of myocardial infarction, ischemic stroke, convulsive seizures, acute renal failure and pericardial tamponade during ICU and IMCU stay. Data is provided as mean and standard deviation or percentage of patients in the respective groups.

RESULTS. Patients receiving TXA had increased in hospital mortality (16.2 vs. 7.5%; $p = 0.01$). The rate of convulsive seizures was increased in patients receiving TXA (6.7 vs. 1.9%; $p = 0.03$). Patients receiving TXA had increased total postoperative blood loss during first 48 h ICU stay [845 mL (1065) vs. 508 mL (507); $p < 0.01$], increased rate of surgical reexploration (14.3 vs. 3.3%; $p < 0.01$) and 50.9 vs. 37.3% patients received red blood cell transfusion ($p < 0.01$). Patients receiving aprotinin showed a tendency for increased stroke (4.2 vs. 1.0%; $p = 0.12$) and had increased neurologic disabilities (7.0 vs. 1.0%; $p = 0.02$). No difference regarding biomarkers, myocardial infarction, acute renal failure and pericardial tamponade was observed.

DISCUSSION. The minor efficiency of TXA and the increased in hospital mortality and rate of transfusion, surgical reexploration and a higher rate of con-vulsive seizures warrant critical reconsideration of routine administration of high dose TXA. Further prospective studies evaluating the efficacy and safety profile of TXA are urgently needed.

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0501

RELATIVE IMPACT OF ADULT CARDIAC SURGERY RELATED ACUTE RENAL FAILURE (ACS-ARF) AND ORGAN DYSFUNCTION OR FAILURE ON OUTCOME. A PROSPECTIVE COHORT STUDY

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INTRODUCTION. ACS-ARF is a frequent complication which impacts on postoperative length of stay (LOS) and mortality. Its relationship with occurrence of organ dysfunction or failure has not been evidenced by prior studies.

OBJECTIVES. To evaluate relationship between ACS-ARF and organ failure on outcome in cardiac surgery patients

METHODS. Single center, prospective cohort study on consecutive cardiac surgery patients. ARF was classified according to international consensus classification of RIFLE. Prospectively collected clinical and laboratory data were used for assessing organ dysfunction and outcome.

RESULTS. Among 700 subjects the incidence of ARF was 17%. ARF Risk occurred in 59 (48%), ARF Injury in 43 (36%) and ARF Failure in 19 (16%). Renal Replacement Therapy was performed in 13 (11%) ARF subjects. Compared to those without ARF, patients with ARF had longer ICU stay (median days 2 [interquartile range 2–3] vs. 5 [3–7]) and hospital stay (8 [7–11] vs. 12 [9–15]). In the overall cohort, in-hospital mortality rate was 1.7%. In subjects without ARF, mortality was 0.2%, in those with ARF Risk 5%, with ARF Injury 2% and in those with ARF Failure 37%. After univariable and multivariable logistic regression analysis, age (OR 1.04 [1.02–1.07 95% CI]), additive EUROScore (OR 1.09 [1.01–1.18 95% CI]) and total SOFA score on postoperative day 1 (OR 1.32 [1.20–1.44 95% CI]) were independent predictors of ARF development. In the multivariable logistic regression model, besides ARF (4.87 [2.88–8.23 95% CI]), additive EuroSCORE (OR 1.27 [1.17–1.38 95% CI]), cardiovascular SOFA score (OR 1.39 [1.07–1.80 95% CI]) and Total SOFA score on day 1 OR 1.27 ([1.10–1.4895% CI]) were associated with prolonged ICU LOS. Furthermore, independent predictors of a longer hospital LOS were additive EuroSCORE (OR 1.20 [1.126–1.284 95% CI]), ARF (OR 1.973 [1.239–3.141 95% CI]), and total SOFA score on day 1 (OR 1.133 [1.033–1.243 95% CI]). At univariable logistic regression analysis, respiratory, platelet, liver, renal and total SOFA score were associated with outcome. At multivariate logistic regression analysis total SOFA score on day 1 (OR 1.813 [1.222–2.691 95% CI]) and multi organ failure (OR 5.515 [1.014–29.980]) were predictive of mortality.

CONCLUSIONS. ACS ARF is a risk factor for prolonged ICU and hospital stay, it is aggravated by high mortality rates and it parallels organ dysfunction and failure in the postoperative setting.

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0502

PLATELET REACTIVITY DURING CARDIOPULMONARY BYPASS - MARKED REDUCTION FOLLOWED BY EARLY RESTITUTION

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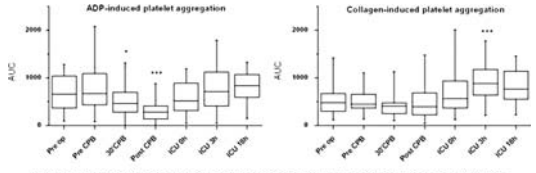
INTRODUCTION. Cardiopulmonary bypass (CPB) affects platelets, and platelet dysfunction is considered to be an important risk factor for post-operative bleeding after coronary artery bypass graft (CABG) surgery. Monitoring platelet function in the peri-operative period therefore is of importance to reduce morbidity due to both bleeding and post-operative graft occlusion. Our aim was to study platelet reactivity in CABG patients in the peri-operative period.

METHODS. Platelet function in 30 patients undergoing CABG was analyzed using an impedance aggregometry point-of-care (POC) instrument (Multiplate®). Platelet reactivity was measured preoperatively at induction of anaesthesia, preoperatively immediately before CPB, after 30 minutes of CPB, after end of CPB, postoperatively at arrival to the ICU and finally at 3 and 18 h after surgery. Whole blood platelet aggregation was measured after activation with ADP (adenosin diphosphate), TRAP (thrombin receptor activating peptide), AA (arachidonic acid) and collagen. Platelet count was measured, and circulating platelet pool was assessed by correcting for hemodilution by indexing to hemoglobin. Non-parametric statistics were used, results are presented as median and 25–75%-percentiles.

RESULTS. Reactivity to ADP, TRAP and AA agonists was significantly reduced at 30 min of CPB and at the end of CPB, followed by a rapid increase after CPB to preoperative values. Collagen showed a similar, but not significant, decrease during CPB followed by a post-CPB increase to values above baseline ($p < 0.001$). Platelet count dropped after 30 min of CPB from 240 (204–301) preoperatively to 150 (132–189) after 30 min of CPB and further to 134 (120–151) $\times$ 10^9/L at the end of CPB ($p < 0.001$). Corrected for blood loss and hemodilution there was a reduced platelet pool at the end of CPB and at arrival at the ICU ($p < 0.001$)



Whole blood aggregometry after activation with ADP and collagen. Box whisker plot indicate median, 25%, 75%, max and min. * and *** denotes p< 0.05 and p< 0.001 as compared with baseline (pre op). Dotted line is normal levels.

CONCLUSION. There is an early decrease in platelet reactivity during CPB followed by a rapid post-CPB restitution of platelet function, despite low preoperative aggregometry values and lower post-CPB platelet count. The rapid preoperative changes in aggregometry points to a possible role for POC analysis of hemostatic function. The post-CPB increase in platelet reactivity simultaneously to the decrease in platelet count could imply increased aggregating tendency for remaining platelets, with possible implications for early graft failure and post-operative anti-platelet therapy.

0503

CRITICAL RHABDOMYOLYSIS AFTER SURGERY FOR ACUTE AORTIC DISSECTION

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BACKGROUND. Rhabdomyolysis is an important cause of acute renal failure and potentially life threatening especially after aggressive operation such as acute aortic dissection surgery. Our experience are showed and analysis of the factors resulting in rhabdomyolysis are presented.

METHODS. We retrospectively analysed 50 patients who underwent emergent acute aortic dissection operation over past 3 years. Among them, five patients (10%) presented critical rhabdomyolysus (myoglobin > 10,000 ng/ml) postoperatively without significant findings of limb ischemia.

RESULTS. Among 5 cases, mean extracorporeal circulation (ECC) time was 418 min, cardiac arrest time was 169 min, open distal anastomosis time was 107 min. Rhabdomyolysis occured immediately after operation and maximum serum myoglobin level was 56,530 ng/ml (mean) on the postoperative day of 1or2. Continuous veno-venous hemodiafiltration (CVVH) was performed in 3 cases for 3.5 days. One case with mesenteric malperfusion died of multiple organ failure. Factors influencing onset of rhabdomyolysis were ECCtime ($p = 0.003$) and operation time ($P = 0.002$) . ECCtime and CPK level on the 1st operative day correlated significantly (rs = 0.62 $p < 0.01$) in total 50 cases.

CONCLUSION. 10% of cases after emergent operation for acute aortic dissection showed critical rhabdomyolysis. With intensive treatment including CVVH, rhabdomyolysis was treated successfully in four patients.

0504

RISK FACTORS FOR VOCAL CORD PARALYSIS IN PATIENTS UNDERGOING CARDIOVASCULAR SURGERY

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INTRODUCTION. Vocal cord paralysis is known as a complication of cardiovascular surgery. But its risk factors are unknown.

OBJECTIVES. We examined postoperative risk factors for vocal cord paralysis after cardiovascular surgery.

METHODS. A prospective observational study. 113 patients (female, 46; male, 67) who underwent coronary artery bypass graft, valve, and/or aortic operations were enrolled. Flexible laryngoscopy was performed on all patients to evaluate vocal cord function within 24 h after extubation. Sex, age, tracheal tube cuff pressure after operation, emergent operation, body mass index (BMI), chronic renal failure on hemodialysis, hypertension, diabetes mellitus (DM), chronic obstructive lung disease, history of smoking, history of cerebral infarction, history of coronary artery disease and operation time were evaluated as risk factors using Pearson's chi-square test. Multivariate analysis was performed among parameters with a p value less than 0.20.

RESULTS. 33 patients (29.2%) had ipsilateral or bilateral vocal cord paralysis. Left vocal cord paralysis occurred more frequently (26 patients) than right (6 patients) or bilateral (1 patient). Multivariate analysis revealed that incidence of vocal cord paralysis significantly increased with DM (odds ratio [OR], 3.2; 95% confidence interval [CI], 1.2–8.7), operation time greater than 8 h (OR, 3.2; 95% CI, 1.1–9.1) and BMI less than 25 (OR, 3.6; 95% CI, 1.2–13.0).

CONCLUSIONS. DM, operation time greater than 8 h and BMI less than 25 were significant risk factors for vocal cord paralysis after cardiovascular surgery.

0505

PERIOPERATIVE MANAGMENT OF PATIENT WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE (COPD)

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INTRODUCTION. There is lack of studies investigating procedures aiming at a decrease in perioperative mortality in patients with COPD. Perioperative attention should be focused on a secure airway and the duration of monitoring that is necessary regarding severity of COPD, surgical stress and respiratory function. Postoperatively, residual neuromuscular blockade and a supine position have to be avoided. CPAP or NIPPV should be administered as soon as feasible after surgery.

METHODS. 8 postoperative abdominal surgery patients with COPD (6 m, 2 f), age 72.5 ± 5.5, were studied (elective sigmoid resection four patients; elective right hemicolectomy four patients, emergency right hemicolectomy four patients). All patients receive balanced anaesthesia (remifentanyl + sevoflurane), postoperative continuos epidural analgesia (bupivacaine 0.5% 10 ml/h for 3 days) + tramadol i.v. and BIPAP with mask (2 patients, IPAP/EPAP 10–12/4–5 cmH_20; Fr = 10–12) or CPAP with mask and Boussignac valve (6 patients PEEP = 4–6 cmH_2O), in postoperative.

RESULTS. No adverse respiratory events were observed in all patients. Epidural bupivacaine plus tramadol resulting in excellent pain relief. The patients were discharged home 5 ± 2 days after surgery.

CONCLUSIONS. Perioperative administration of BiPAP or CPAP, excellent pain control by continuous epidural infusion of local anesthetic may have contributed to these patient's uncomplicated postoperative course.

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0506

NO SAD (DAILY NOTIFICATION OF SLUMBER OR SEDATION, ANALGESIA, ABSTINENCE, AND DELIRIUM)

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OBJECTIVE. To evaluate the introduction of a new protocol called NO SAD (daily notification of slumber or sedation, analgesia, abstinence, and delirium). In other words, it is a daily-collected evaluation and notification of alterations in slumber, degree of sedation, and analgesia as well as symptoms and signs of abstinence and delirium. The protocol encompasses the four evaluations above once they share some characteristics as to their its manifestations, treatments and success in ICU release.

METHODS. All the patients would be evaluated in the morning by the team of medical and nursing professionals, followed by the listing of guidelines based on the protocols of sedation, analgesia, abstinence, and delirium, aiming at an uniform guideline making.

Patients would be evaluated at any moment and the guidelines changed accordingly in case the clinical profile showed any alterations.

Slumber evaluation would be carried out through simple patient questioning. Sedation levels would be checked by means of the Ramsay scale and Richmond's agitation and sedation scales (RASS).

Pain would be classified in relation to intensity with the numeric scale from (0) absence of pain to (10) unimaginable pain.

Tobacco abstinence would be prevented by using nicotine pads.

The use of alcohol, opioids, and benzodiazepinics would be registered and abstinence symptoms looked for during daily evaluation.

Delirium would be evaluated through CAM-ICU, a confusion assessment method for ICU-committed sensitive and 95% specificity patients.

RESULTS. The introduction of such protocol has been carried out during a 2-week training period attended by the physicians and nursing teams.

After training the evaluation of sedation and analgesia quality as well as abstinence signs and delirium happened on regular and systematic basis with guidelines made according to established protocols.

CONCLUSION. The introduction of a protocol that joins the evaluation of slumber and sedation quality and the occurrence of pain, delirium and abstinence enabled the standardization of treatment by a trained team improving the assistance quality.

0507

ELECTRIC NEUROMUSCULAR STIMULATION FOR PREVENTION OF ICU ACQUIRED PARESIS IN PATIENTS WITH SEVERE SEPSIS

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INTRODUCTION. Muscle weakness is frequently recognized in septic patients requiring mechanical ventilation (MV) after awakening. This acquired paresis has prognostic implications. However, no specific preventive or therapeutic treatment has been described.

OBJECTIVE. To evaluate the potential protective effect of transcutaneous electric neuromuscular stimulation (TENS) on muscle strength, in patients on MV suffering from severe sepsis.

METHODS. Patients were included in the first 48 h following ICU admission when sepsis requiring MV and organ failure, other than respiratory dysfunction (SOFA score ≥3), were present. Those with previous neurological or orthopaedic diseases, prolonged immobilization or marked alteration of performance status were not included.

TENS on biceps and quadriceps of one side of the body was performed twice a day (30 min) with a Multiplex® Classic device (Meditea, Argentina) in LP mode from inclusion until MV withdrawal. Stimulation side was randomised on inclusion according with cerebral dominance.

Measurements were performed by blinded operators (physiotherapist and radiologist). Arm and thigh circumference and biceps thickness measured by echography were registered every 72 h. Biceps and quadriceps strength was evaluated with the Medical Research Council (MRC) grading system (0 paralysis to 5 normal force) before MV withdrawal.

Continuous data are expressed as median (25–75th percentiles). Wilcoxon signed ranks test was used for comparisons.

RESULTS. Twelve patients were included. APACHE II and SOFA at inclusion were 19 (17–27) and 10 (9–12). Length of stay in the ICU was 23 days (12–43). TENS was applied for 14 days (6–36). Three patients died before muscle strength evaluation was possible.

Changes in arm (ΔArm) and thigh (ΔThigh) circumference and biceps thickness (ΔBiceps) from baseline to MV withdrawal and muscle force performance are shown in the Table 1.

TABLE 1

	Stimulated side	Non stimulated side	*P*
ΔArm (cm)	−1.0 (−2.5–0.0)	−0.5 (−2.5–0.0)	0.919
ΔThigh (cm)	1.0 (−0.5–4.1)	1.7 (0.0–3.5)	0.202
ΔBiceps (mm)	0.0 (−2.5–1.8)	−1.0 (−1.6–1.0)	0.838
Biceps force[a]	4.0 (3.0–4.0)	3.0 (2.0–4.0)	0.025
Quadriceps force[a]	3.0 (3.0–4.0)	3.0 (2.0–3.5)	0.180

[a]MRC score, $n = 9$

CONCLUSIONS. We observed a clinically significant increase in muscle strength in stimulated biceps. However, no change in circumference and biceps thickness was found, suggesting that force preservation was not related to less muscle mass loss.

0508

ELECTRICAL MUSCLE STIMULATION PREVENTS CRITICAL ILLNESS POLYNEUROMYOPATHY IN ICU PATIENTS - A RANDOMIZED PARALLEL INTERVENTION TRIAL

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INTRODUCTION. Critical illness polyneuromyopathy (CIPNM) is a common consequence of critical illness presenting with limb weakness and delayed weaning, resulting in extended ICU and hospital stay and increased health cost. No effective method of prevention or treatment has been suggested. Electrical muscle stimulation (EMS) has been used effectively in patients with severe COPD or advanced CHF in improving muscle strength and exercise tolerance. This study was aimed at investigating the role of EMS in preventing the appearance of CIPNM.

METHOD. One hundred twenty-six consecutive patients (82 male and 44 female, age: 59 ± 19 years) admitted to the ICU were evaluated using the APACHE II (18 ± 5). Patients with APACHE II score ≥ 13 at admission were assigned, after stratified randomization (age, gender), to an EMS intervention and a control (CON) group. Exclusion criteria were pre-existing neuromuscular disease, terminal disease, BMI > 35 kg/m^2, age < 18 years, pregnancy, connective tissue disease, bone fractures, skin lesions that did not allow the use of EMS, pacemakers, readmission, length of stay <48 h. EMS (45 Hz, 400 μs, 12 s on–6 s off, at intensities able to cause visible contractions) was applied to the vastus lateralis, vastus medialis and peroneus longus of both lower limbs 7 days/week, 45 min/session, once daily. The CIPNM diagnosis was based on the MRC scale for muscle strength, which requires patient's cooperation. Grading was conducted by two independent investigators within 24 h, on 12 muscle groups of the upper and lower limbs. MRC score <48 (out of 60) was the diagnostic criterion for CIPNM. Statistical analysis employed chi-square and Kaplan–Meier analysis.

RESULTS. CIPNM evaluation was feasible in 50 patients (EMS group: 23, CON group: 27) out of 126 (44 died, 32 had poor cooperation). Three patients of the EMS group (13%) and 11 of the CON group (41%) were diagnosed with CIPNM. A chi-square test showed significant between-group difference ($p < 0.05$). Based on Kaplan-Meier analysis, a difference ($p = 0.07$) between the EMS group (mean ± SD: 13 ± 9 days, median: 9, range: 4–33) and the CON group (mean ± SD: 21 ± 19 days, median: 15, range: 3–90) was observed in length of stay, while similar results were obtained in weaning from mechanical ventilation. Furthermore, Kaplan–Meier analysis confirmed a significant difference ($p < 0.05$) between those with and those without CIPNM, irrespective of EMS application, in terms of length of stay and weaning.

CONCLUSION. These results show that EMS prevents development of CIPNM. Further research is necessary to explore the pathophysiological mechanisms that are involved in the prevention of CIPNM with the use of EMS as well as the EMS characteristics that yield the maximum benefit on CIPNM prevention.

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Fluid management and general perioperative care: 0509–0522

0509

THE EFFECT OF 6% HYDROXYETHYLSTARCH 130/0.4 AND 4% GELATIN ON COAGULATION AND BLOOD TRANSFUSION REQUIREMENTS AFTER CARDIAC SURGERY

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BACKGROUND. The question as to the optimal volume replacement for compensating intravascular blood loss is subject of ongoing controversy. Gelatin preparations impair fibrin polymerization and disturb the network of the fibrin monomers in addition to their dilutional effects. Moreover, reduced clot elasticity and clot weight have been reported because of gelatin based volume replacement. Hydroxyethyl starch (HES) is associated with an increased tendency for bleeding, especially when using high molecular weight solutions with high replacement degree. HES solutions cause a von Willebrand type 1-like syndrome characterized by diminished FVIII activity, diminished vWF plasma levels and impaired fibrin polymerization. 6% HES 130/0.4 (Voluven®, Fresenius, Pharma Austria GmbH), a modern, medium molecular weight and low substitution degree starch preparation was hypothesized to affect the coagulation system less strong than older HES preparations.

Until now, no clinical data are available comparing the effects of 6% HES 130/0.4 (Voluven®) and gelatin on coagulation parameters and transfusion of blood products in patients following cardiac surgery.

MATERIALS AND METHODS. 1.050 patients were analysed retrospectively after cardiac surgery between January 2005 and December 2006. They either received gelatin ($n = 633$) or gelatine in combination with 6% HES 130/0.4 (Voluven®, Fresenius). Coagulation parameters and blood transfusion requirements were evaluated immediately after ICU admission and on the first postoperative day. Differences in laboratory parameters between time of ICU admission and the first postoperative day between these groups (gelatine vs. gelatine/HES) were analyzed using a *t* test for independent groups. Differences in blood products usage were analyzed using a Mann–Whitney *U* test, since assumption of normality were not attained. *P* values < 0.05 were assumed statistically significant.

RESULTS AND DISCUSSION. Upon admission to the ICU and on the first day after surgery, patients who received 6% HES 130/0.4 showed a significantly smaller increase in plasma fibrinogen concentrations (60 ± 61 vs. 71 ± 63 mg/dl; $p = 0.006$) when compared to patients treated with gelatin alone after cardiac surgery. This effect of 6% HES 130/0.4 on plasma fibrinogen levels was dose dependent. Furthermore, platelet count in the patients treated with 6% HES 130/0.4 decreased, while platelets in the patients who received gelatin alone increased after admission at the ICU ($p = 0.004$). 6% HES 130/0.4 treated patients also showed a higher need for transfusion of packed red blood cell concentrates (median transfusion rate of 0.81 vs. 0.65 unit of packed red cells; $p < 0.05$) during the observation period.

CONCLUSION. Our clinical data correspond well with several experimental trials, showing that impairment of the coagulation system after 6% HES 130/0.4 is significantly more pronounced when compared to the use of gelatine alone after cardiac surgery.

0510

EFFECTS OF HYPERTONIC SALINE (HTS) ON EX VIVO WHOLE BLOOD PEPTIDOGLYCAN (PEPG) OR LIPOPLYSACCHARIDE (LPS)-STIMULATED CYTOKINE RESPONSE

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INTRODUCTION. Infusion of HTS rapidly expands plasma volume in shock therapy. The physical and physiological effects last for a relatively short period of time, and it has been a commonly held view that they cannot not fully account for the increased survival rates seen after HTS treatment. Subsequently, specific immunomodulating qualities have been revealed. The clinical utility value after common dosing, however, has been questioned [1]. In the present study we have measured how increasing osmolalities caused by HTS influence the values of selected cytokines after stimulation with PepG or LPS.

METHODS. Freshly drawn blood from ten healthy donors was exposed to osmolalities ranging from 295 to 480 mOsm/kg. In a whole blood model, the samples were stimulated with PepG 1 μg/ml or LPS 10 ng/ml for 6 h at 37°C. We evaluated the leukocyte response according to the concentrations of selected cytokines in the supernatant. Cellular viability, as tested by trypan blue straining, was strongly reduced at 480 mOsm/kg. Therefore, only results from tonicities $\leq$375 mOsm/kg were included.

RESULTS. Increasing extracellular osmolality diminished TNF-α, IL-1 β, and IL-6 values in an osmolality-dependent way in samples stimulated with PepG. Statistical significance was reached at 315 mOsm/kg (IL-6) and 335 mOsm/kg (TNF-α and IL-1 β). In cells stimulated with LPS this effect of HTS was absent. The PepG or LPS-stimulated concentrations of IL-1 ra, IL-10, and IL-12 were only moderately affected; IL-8, MCP-1, and RANTES hardly. For the latter six variables, the choice of immune stimulator was of minor importance.

CONCLUSIONS. Osmolalities not exceeding commonly encountered clinical values, i.e. $\leq$315 mOsm/kg, in general had insignificant effects on the selected cytokine concentrations. These observations may explain some of the conflicting, and often disappointing, results obtained from clinical trials.

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0511

RESPIRATORY VARIATIONS IN THE PULSE OXIMETER WAVEFORM AMPLITUDE AS INDICATOR OF FLUID RESPONSIVENESS

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INTRODUCTION. Dynamic preload-dependency index as respiratory pulse pressure variations are useful to predict fluid responsiveness during a surgical procedure. However, invasive arterial catheter is necessary to measure such a parameter. The aim of this study was to validate the respiratory variations in the pulse oximeter waveform amplitude as a noninvasive index of fluid responsiveness.

Patient and method: Eleven patients undergoing digestive or vascular surgery were included. Cardiac output was evaluated by oesophageal Doppler (Hemosonic 100, Arrow). Arterial pressure and plethysmographic waveform was recorded using an arterial catheter and a pulse oximeter connected to the Intellivue monitor (Philips) allowing to calculate pulse pressure (PPV) and plethysmographic (Pleth) respiratory variations. A fluid challenge (250 ml of hydroxyethyl starch) was realized whenever a 20% decrease in systolic blood pressure and/or a 20% increase in heart rate were observed. Responders to fluid challenge were defined by a 10% increase in stroke volume. The capability of these indexes to predict fluid responsiveness was analysed by a Receiver Operating Characteristic (ROC) curve. Correlations between PPV, Pleth and stroke volume variation during fluid challenge were evaluated by a Rho Spearman test.

RESULT. Area under ROC curve for PPV and Pleth were 0.93 and 0.69, respectively with threshold values of 13% (sensitivity: 88%; specificity: 94%) and 18% (sensitivity: 57%; specificity: 80%). Correlation coefficient between PPV and Pleth was 0.5. Correlation between the stroke volume variations during fluid challenge and PPV or Pleth were 0.7 and 0.27, respectively.

DISCUSSION. In our study, respiratory pulse oximeter plethysmographic variations were not a valuable index of preload-dependency during digestive or vascular surgery. These results are not in agreement with former studies.

0512

ANALYSIS OF PROGNOSTIC FACTORS FOR PULMONARY COMPLICATIONS FOLLOWING MAJOR THORACOTOMY FOR LUNG CANCER

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INTRODUCTION. Patients undergoing thoracotomy associated with lung resection are thought to be at high risk for the development of postoperative pulmonary complications (PPCs) during the perioperative period. Aim of this study was to analyse risk profile, outcome and identify predictors of postoperative pulmonary complications following major thoracotomy for lung cancer.

OBJECTIVES. All patients underwent lung resection during a 9-year period (2000–2008) were reviewed.

METHODS. The following information was recorded: age, sex, body mass index, smoking history (pack-year history), comorbid cardiovascular conditions (preexisting history of myocardial infarction, angina pectoris, hypertension, arrhythmia, stroke), preoperative pulmonary function tests, ASA class, preoperative chemotherapy, type and duration of pulmonary resection, quantification of blood loss during the perioperative period (perioperative period and during the first 24 h after the end of surgery) and postoperative analgesic therapies. PPCs (Nosocomial pneumonia, lobar or whole-lung atelectasis, acute respiratory failure, prolonged air leak, pulmonary embolism, ARDS, bronchospasm) were defined as those occurring within 30 days of thoracotomy. Death was analyzed as a separate complication. The risk of PPCs associated with selected factors was evaluated using multiple logistic regression analysis to estimate odds ratios (ORs) and 95% confidence intervals (CIs).

RESULTS. Ninety-nine patients (67 M/32F, mean age: 65.6 years) out of 1,056 experienced PPCs and were studied. Eleven patients (11.1%) died during the 30 days following the surgical procedure. An American Society of Anesthesiology (ASA) score 3 (OR, 2.35; 95% CI 1.23–4.26; $p < 0.05$), an operating time >80 min (OR, 2.68; 95% CI 1.32–3.26; $p < 0.05$), the need for postoperative mechanical ventilation >48 h (OR, 1.72; 95% CI 1.27–3.96; $p < 0.05$) and pneumonectomy (OR, 2.16; 95% CI 1.42–4.93; $p < 0.05$) were independent factors associated with the development of PPCs, which was in turn associated with an increased mortality rate and the length of ICU or surgical ward stay.

CONCLUSIONS. The major predictors for PPCs were ASA physical status, operation time, duration of postoperative mechanical ventilation and pneumonectomy. Pulmonary complications are mainly responsible for mortality of patients undergoing thoracotomy. Surgeons and anesthesiologists must actively participate in the development of more effective preventive strategies.

0513

EFFECT OF IMPLEMENTING ROUTINE OESOPHAGEAL DOPPLER MONITORING IN COLORECTAL AND ORTHOPAEDIC SURGERY

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INTRODUCTION. During major colorectal and orthopaedic surgery, guidelines [1] recommend that intraoperative fluid should be titrated to optimize stroke volume, as this reduced morbidity and shortened length of stay by 2 days in randomized trials using the Deltex Oesophageal Doppler (Doppler). However, in practice implementation has been patchy. We present data from phase 1 of a National Technology Adoption Centre [2] project exploring barriers to technology adoption. There are two hypotheses: (1) that barriers to Doppler implementation can be overcome by targeted education. (2) That the benefits suggested by clinical trials will be seen in practice.

METHODS. This prospective audit was conducted at the Whittington Hospital, a university associated general hospital in London. An educational campaign promoted Doppler use in four groups; elective and emergency colorectal surgery and elective hip replacement and emergency hip fracture surgery. Prospective data was collected regarding Doppler use, length of hospital stay and day 5 Post-Operative Morbidity Survey (POMS) score [3] for three periods in 2008. Period 1, February to May inclusive, prior to the project launch. During Period 2, June to August inclusive, Doppler use was encouraged and training provided. Period 3, September and October, once training was completed.

RESULTS. 202 patients underwent surgery, of which 74 (44 elective, 30 urgent) had colorectal and 127 (67 elective, 61 urgent) hip surgery. Following the educational campaign, Doppler use increased significantly; from 20% in phase 1, to 54% in phase 2, to 62% in phase 3 ($p < 0.01$ by chi squared).The percentage of patients with morbidity on day 5 was significantly reduced in elective colorectal (91–67% $p = 0.04$) and urgent hip surgery (93–25% $p = 0.02$) and trended downward in the other groups. Mean length of stay fell in all four groups by between 1 and 13 days, though the reductions did not attain statistical significance.

CONCLUSION. Phase one of this National Technology Adoption Hub project supports the hypothesis that targeted education can significantly increase Doppler utilisation. The second hypothesis, that trial benefits are realisable in practice, is supported by significant reductions in morbidity in two groups and trends to reduced morbidity and length of stay in all patients. In the next phase of the project, ongoing data collection from the Whittington will be supplemented by additional sites at Derby and Manchester Royal Infirmaries. This will provide data on the practical effect of implementing Doppler monitoring in over 1,000 patients, a dataset larger than the current meta-analysis population [2].

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0514

HOW IS PYREXIA TREATED WITHIN UK INTENSIVE CARE UNITS?

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INTRODUCTION. Fever is strongly associated with mortality in critical illness, particularly in head injury and post stroke conditions, but this is not a proven cause and effect relationship. Efforts to reduce fever are widely practiced although the evidence base is largely absent. The one randomised controlled trial known in literature associated aggressive treatment with higher mortality rate. Some of the applied interventions are potentially harmful. There is no concensus on treating fever in U.K. critical care units, and we suspect that cooling measures are being used routinely but not always appropriately

OBJECTIVE. We designed a telephone survey to find out the current practise of treating pyrexia on ITUs around the country

METHODS. We asked the lead nurse of the units to tell us about their practise. We asked about the number of active beds, the profile of the unit, the temperature at which treatment is started, about who makes the decision, and about the actual treatment given.

RESULTS. Complete answers were obtained from 45 units. Seven were specialised units, the remainder general ITUs. Only ten had a protocol for treating pyrexia. In 28 units, the decision was made by either the medical or the nursing staff, with only eight units requiring a medical decision for initiating treatment. The threshold for starting treatment was 37°C in two units, 38°C in 25, and ten only treating temperatures above 39°C. Eight had variable limits to starting treatment. Both physical and pharmacological means were used no special instructions regarding sequence. Ice packs, forced cool air blankets, wet sheets and cold infusions were the most used physical measures. All units use paracetamol and two also use ibuprofen.

CONCLUSION. Our survey showed considerable variation in practice reflecting the lack of agreement on the need to treat fever. While the benefits and harmful effects may not be of major importance, their widespread use affects many thousands of patients each year in the UK. We would suggest antipyretic measures should not be left to nursing routine.

0515

USE OF HALOPERIDOL FOR PREVENTING AND TREATING SUBSYNDROMAL DELIRIUM AND CLINICAL DELIRIUM IN THE FIRST 24 H AFTER ENDOSCOPIC UROLOGICAL SURGERY

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INTRODUCTION. Delirium (defined in APA and DSM-IV terms) is a seriously problem for the first postoperative 24 h in elderly patients submitted to urological surgery.

OBJECTIVE. We propose that delirium in the first 24 h after endoscopic urological surgery is correlated with the number of risk factors hosted by the patient over 65 years and that it will be diminished by systematically used of oral haloperidol.

METHODS. 150 patients older than 65 years (Table 1) scheduled for urological surgery (males and females) were recruited. They were evaluated for delirium hosted risk factors (alcoholism, cognitive impairment, depression, hypertension, smoking, vision/hearing impairment) and cognitive status (ICDSC score)

TABLE 1 THE PATIENTS (150)

Age (years)	Femeales	Meales	Total
65–69	5	27	32
70–74	3	30	33
75–79	2	22	24
80–84	1	32	33
>85	6	22	28

After premedication (midazolam 0.02 mg/kg and pentazocine 0.45 mg/kg) we performed subarachnoidian anesthesia with bupivacaine (0.15 mg/kg) and, then the urological procedure was performed.

The first evaluation of ICDSC score after surgery was at 4 h then we check ICDSC every 3 h for the first 24 h. All patient with three or more risk factor received 2 mg haloperidol per os in the first hour after surgery. All patient received 2 mg haldoperidol if ICDSC score was 4 or more (maximum 6 mg).

RESULTS. Table 2 describes the number of mental disorders at the first evaluation moment. Table 3 describes ICDSC score at the same moment.

TABLE 1 NUMBER OF RISK FACTORS AND COGNITIVE ALTERATION

	Less than 2 or 2 risk factors	3 and more risk factors
Delirium	9	19
Subsyndromal delirium	21	34
Normal cognitive status	42	15
Total	72	78

Number of risk factors and cognitive alteration

TABLE 1 ICDSC SCORE AT 4 H

	Average	Less than 3 risk factors	3 and more risk factors	*p*
Delirium (18)	6.53 ± 1.72	5.13 ± 2.18*	6.92 ± 1.18*	0.01
Subsyndromal delirium (55)	2.58 ± 0.26	2.06 ± 1.18	2.88 ± 0.58	0.05

ICDSC score at 4 hours

CONCLUSIONS. The severity of mental impairment in elderly patients after urological surgery may be correlated with the number of hosted risk factors. Systematically administration of oral haloperidol is an available and cheep method to tempt to reduce the delirium and subsydromal delirium incidence and severity.

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0516

ANEMIA AND BLOOD TRANSFUSION IN A SURGICAL INTENSIVE CARE UNIT

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INTRODUCTION. Anemia and blood transfusion can influence morbidity and mortality in critically ill patients.

OBJECTIVES. To investigate the epidemiology of anemia and blood transfusion in a large cohort of surgical intensive care patients.

METHODS. We included all adult patients (>18 years old) admitted to the intensive care unit between 1 March 2004 and 30 July 2006. Data recorded prospectively on admission included age, gender, referring facility, primary and secondary admission diagnoses, and surgical procedures. A priori subgroups were defined arbitrarily according to admission characteristics and included age (18–50, 51–65, 66–80 and more than 80 years old), SAPS II score (<24, 25–50, 51–75 and >75), SOFA score (0–4, 5–8, 9–12 and more than 12), surgical procedures (cardiovascular vs. non-cardiovascular surgery), and the occurrence of severe sepsis.

RESULTS. Of 5,925 patients, 1,833 (30.9%) received a blood transfusion in the intensive care unit. Hemoglobin concentrations were <9 g/dl on at least one occasion in 57.6% of patients. Lower hemoglobin concentrations during the intensive care unit stay were associated with higher Simplified Acute Physiology II scores and Sequential Organ Failure Assessment scores, greater mortality rates, and longer intensive care unit and hospital lengths of stay. Transfused patients had higher intensive care unit and hospital mortality rates (12.5 vs. 3.2 and 18.3 vs. 6.5%, respectively, $p < 0.001$ pairwise) and longer intensive care unit and hospital lengths of stay than non-transfused patients. In multivariable analysis, higher hemoglobin concentrations (RR 0.97, 95% CI: 0.95–0.98, per 1 g/dl, $p < 0.001$) and blood transfusion (RR 0.96, 95% CI 0.92–0.99, $p = 0.031$) were independently associated with a lower risk of in-hospital death.

CONCLUSIONS. In this group of surgical ICU patients, anemia was common and was associated with higher morbidity and mortality. Higher hemoglobin concentrations and receipt of a blood transfusion were independently associated with a lower risk of in-hospital death. The groups that were more likely to benefit from blood transfusion were elderly patients and patients with a higher severity of illness and more organ dysfunction.

0517

PREDICTORS OF HOMOLOGUE BLOOD TRANSFUSION IN THE ICU AFTER MAJOR ORTHOPAEDIC SURGERY: A RETROSPECTIVE COHORT STUDY

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INTRODUCTION. Homologue blood transfusion is not without risk and always has a high cost [1]. This study was designed to detect patients prone to receive homologous blood transfusion after major orthopaedic surgery in order to optimize our perioperative management.

METHODS. Following institutional guidelines a retrospective cohort study reviewing 100 consecutive files of hip and knee arthroplasty was conducted using stepwise logistic regression with transfusion as the outcome measure. Preoperative Hb level (Hb_preop), age, BMI, gender, type of surgery, revision or not, application of acute normovolemic hemodilution (ANH) entered as the independent variables. Additionally, the best cut-off value for Hb_preop to predict transfusion was sought by analysis of the Receiver Operating Characteristics (ROC).

RESULTS. Logistic regression revealed repeat surgery as an increased risk (OR: 24; 95% CI: 2.5–5.3; $p = 0.006$) and higher preoperative Hb levels as a reduced risk (OR: 0.59; 95% CI: 0.32–0.91; $p = 0.047$). ROC analysis (AUC = 0.650, $p = 0.028$) indicated a Hb_preop of 11.2 g/L as a fair cut-off value predicting homologous transfusion with sensitivity 29% and specificity 95% (Fig. 1).

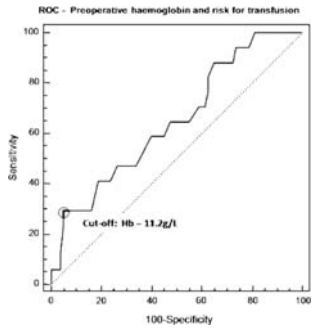

Fig. 1 ROC

DISCUSSION. Exposure to repeat surgery was a major determinant of homologous transfusion in this study population. High-normal preoperative Hb levels significantly reduce transfusion risks and make these patients also more eligible for ANH. None of the ANH patients received homologous blood, which is in accordance with previous studies [2]. By contrast, transfusion risks for aenemic patients are rather unclear and indefinable as evidenced by the low sensitivity (29%). Therefore and, in conclusion, low Hb patients and especially those scheduled for repeat surgery deserve a more meticulous approach. They may benefit from induced preoperative Hb increases using exogenous erythropoetin combined with a high commitment towards red blood cell saving techniques peroperatively.

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0518

THE USE OF BLOOD PRODUCTS IN MASSIVE BLEEDING: A PRELIMINARY REPORT

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BACKGROUND. In patients with severe bleeding, the appropriate use of packed red blood cells (PRBC), fresh frozen plasma (FFP) and platelet concentrate (PLT) has been hypothesized to be correlated with a better survival rate [1], but so far data available on this issue are limited. A 2-year multi-centre observational study was conducted to evaluate the relationship between the use of blood products in massive transfusion and outcome.

METHODS. Patients admitted in three hospitals of the Modena district in two consecutive years and receiving more than seven units of PRBCs in 24 h were included in the study. The cause of bleeding (i.e. trauma, surgery, gastrointestinal and other causes), the number of PRBCs, FFP and PLT units infused in a 24 h-period after the first PRBC unit and the hospital mortality were recorded for each patient. To evaluate the effect of an appropriate use of blood components, we normalized the FFP and PLT units used according to PRBCs units transfused in each patient.

RESULTS. 134 patients were included in the study (24.2% females; age 59 ± 20 years; 34.07% trauma, 44.44% surgery, 5.93% gastrointestinal and 15.56% other causes). The overall hospital mortality rate was 41%. The PRBC (11.3 ± 5.4 units), FFP (7.3 ± 5.4) PLT (3.6 ± 5.9) units infused in survivors were slightly lower than those infused in non-survivors (PRBC 12.9 ± 6.1, PLT 5.6 ± 7.7, FFP 9.9 ± 6.8. The normalized ratios of FFP (0.60 ± 0.38) and PLT (0.26 ± 0.44) units to PRBCs units were also lower ($p < 0.05$) in survivors than in non-survivors (FFP 0.75 ± 0.40 and PLT 0.39 ± 0.58).

CONCLUSION. The above preliminary data indicate that in massive bleeding the amount of blood products infused, regardless of the type, is directly related to mortality and that an increased use of FFP and PLT per unit of PRBC infused does not seem to modify the patient outcome.

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0519

INTRAVENOUS PARACETAMOL REDUCED THE USE OF OPIOIDS AND EXTUBATION TIME AFTER MAJOR SURGERY IN INTENSIVE CARE UNIT

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AIM. This study assessed the analgesic efficacy, side effects and time to extubation of intravenous paracetamol when administered as an adjuvant to intravenous mepheridine after major surgery in intensive care unit.

METHODS. Patients were randomized post-operatively into two groups in ICU. Patients received either 100 mL serum saline IV every 6 h and IV mepheridine ($n = 20$ Group M) or IV paracetamol 1 g every 6 h and IV mepheridine ($n = 20$, Group MP) into a peripheral vein over a 24 h. Behavioral Pain Scale (BPS) is used until extubation and visual analogue score is (VAS) used after extubation. When BPS and VAS values were >4, meperidin 1 mg/kg i.v. was administered and noted in two groups. Pain scores, total meperidine consumption, side effects, time to extubation are 24 h postoperatively noted.

RESULTS. Postoperative mepheridine consumption, extubation time, BPS and VAS scores significiantly lower in group paracetamol–mepheridine ($p < 0.05$). In addition to, postoperative nausea–vomiting were significantly lower in group paracetamol–mepheridine when compared with alone mepheridine ($p < 0.05$).

CONCLUSION. We have demonstrated important clinical benefits by the addition of 4 g/day paracetamol to mepheridine after major surgery. This benefit has been shown in a range of patients under routine clinical conditions and therefore has important practical consequances in ICU. These data suggest that intravenous paracetamol is a useful component of the multimodal analgesia model, especially after major surgery

0520

WHICH ARE THE QUANTITATIVE VARIABLES THAT MAY IMPACT ON PATIENTS UNDERGOING CABG SURGERY?

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INTRODUCTION. The mortality of CABG surgery is ranging from 2 to 5% although continuously decreasing, in relation to better surgical and anaesthetic practice.

TYPE OF STUDY. Prospective observational cohort study.

STUDY AIM. To assess if the following selected quantitative variables (1) age, (2) cardiopulmonary by-pass (CPB) time, (3) aortic cross clamp (ACC) time, (4) duration of mechanical ventilation (MV), (5) red blood cells (RBC) transfusion units, (6) fresh frozen plasma (FFP) transfusion units, (7) ICU length of stay (LOS), may impact on patient hospital outcome.

METHODS. On all the patient undergoing CABG surgery admitted to our ICU, since 1997 through June 2004 we collected the above quantitative variables and put them into an electronic database. ROC curve analysis was performed in a view to assess which one of the variables was the best predictor of patient hospital outcome. Statistic analyses were performed using SPSS Software. P values < 0.05 were considered statistically significant.

RESULTS. We considered a total of 3,269 patients undergoing CABG surgery, with a median (IQR) age of 67 years (59–73). ROC curve analysis results are shown in the Table 1.

TABLE 1

Variables	Area	Specificity (%)	Sensitivity (%)	p values	95% CI
MV length ≥ 11.5 h	0.844	75	70	0.001	(0.765–0.923)
ICU-LOS ≥ 36 h	0.732	74	70	0.001	(0.616–0.848)
Age ≥ 68.5 years	0.569	61	59	0.230	(0.452–0.685)
CPB-time ≥ 90 min	0.682	79	73	0.001	(0.580–0.785)
ACC-time ≥ 60 min	0.523	58	55	0.682	(0.415–0.631)
RBC transfusions ≥ 2.5 units	0.882	79	78	0.001	(0.823–0.942)
FFP transfusions ≥ 3.5 units	0.813	75	80	0.001	(0.723–0.904)

CONCLUSIONS. We found that the best quantitative variables predicting patient hospital outcome are MV length ≥11.5 h, RBC transfusions ≥2.5 units and FFP transfusions ≥3.5 units; CPB and ACC time together with patient age and ICU LOS are likely to impact less importantly on patient outcome.

0521

OUTCOME AND USE OF CRITICAL CARE RESOURCES, FOLLOWING EMERGENCY LAPAROTOMY, AT A LARGE DISTRICT GENERAL HOSPITAL IN THE UNITED KINGDOM

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INTRODUCTION. It is becoming increasingly recognised that there is a population of non-cardiac surgical patients at high risk of complications and death [1, 2]. The emergency laparotomy represents one such group of patients with a high overall mortality and long length of hospital stay. It has recently been suggested that outcome could be improved in high-risk general surgical patients by adequate provision and more effective utilisation of critical care resources [1]. At Southend Hospital, the outcomes, lengths of stay and postoperative pathways following emergency laparotomy have not been defined in recent years.

OBJECTIVES. The aim of the study was to determine the number of emergency laparotomies performed over a 12-month period, to determine basic patient demographics in-hospital mortality, length of stay and use of critical care resources.

METHODS. A list of all emergency operations was obtained from the electronic theatre system. The list was filtered to select only primary laparotomies. Basic patient demographics were extracted from this list. Using the patient administration system, the patient in-hospital pathway, length of stay and mortality was determined.

RESULTS. There were 288 primary laparotomies. The mean patient age was 67 years. There were 52% male and 48% female patients. The overall in-hospital mortality rate was 12.8% ($n = 37$). The mean length of stay was 22 days (median: 15 days). Primary postoperative destinations were as follows: Ward 57%; HDU 15%; ICU 28%. The overall in-hospital mortality by post-op destination was as follows: Ward 6%, HDU 9%, and ICU 23%. Of the 37 deaths, one died on table. Of the remaining 36 deaths, 75% ($n = 27$) went to ICU or HDU immediately after operation. 25% ($n = 9$) went straight to the ward following surgery. Of the patients that went straight to the ward, 13 (7.9%) had to be sent to ICU or HDU afterwards. The overall mean length of stay by destination was as follows: ward 17 days, HDU 26 days and ICU 30 days.

CONCLUSIONS. The results suggest that for this group of patients Southend Hospital's performance compares favourably with recently published figures [1]. It is a concern that amongst patients that die, 25% are not admitted to either Critical Care or the Surgical HDU immediately post operatively. We acknowledge the relatively small number of patients (288) within this study is its principle limitation, and that further work looking at other high-risk surgical groups, for both elective and emergency groups is warranted.

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0522

INTRACRANIAL VENOUS THROMBOSIS IN PERIPARTUM: CASE REPORT

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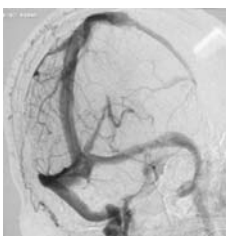
INTRODUCTION. Intracranial venous thrombosis is a rare but potentially fatal complication of pregnancy and postpartum period. The presenting symptoms mimic those of a postural puncture headache (PDPH) in a parturient who has undergone regional anesthesia and caesarian section.

CASE REPORT. A 36-years-old pregnant woman affected by hypertension, diabetes, and obesity in first day after third caesarian delivery, had positional headache treated as PDPH without benefit. In second postoperative day blindness and loss of consciousness occurred; the patient was admitted in ICU and we managed oro-tracheal intubation. CT scan showed a subdural left temporal-phronto-parietal haemorrhage, edema, and moderate median line shift. Angio-RM showed thrombosis of anterior side of sagittal sinus (Fig. 1). The patient was treated with UFH in continuous endovenous infusion, keeping aPTT-ratio $>1.5 < 2$. After 12 h, CT scan showed a slight reduction of haemorrhage and median line shift. During hospitalization, the patient was always conscious and treated for the intracranial hypertension. In fifth day of hospitalization, she was discharged.



DISCUSSION. Due to risk factors and coagulation abnormalities absence (normal values of PT/INR, aPTT, fibrinogen, ATIII, platelet count), her symptoms were underestimated, with delay of diagnosis. In ICU we found a hyper-coagulation pattern (TEG-CI 7, FVII 148%, FVIII 246%, PAI-1 0 U/ml), even if genetic anomalies were absent. At the discharge, the coagulation parameters returned to normal value.

CONCLUSION. In our experience, an early differential diagnosis between PDPH and intracranial venous thrombosis is the most important goal for a good prognosis and an easy and fast screening, as TEG, could be useful. In suspected clinical cases, a second level test of coagulation pattern is recommended.

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Neurological emergencies: 0523–0536

0523

CRITICAL ILLNESS MYOPATHY (CIM): EARLY DETECTION AND OUTCOME

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OBJECTIVES. To investigate a method for early detection of myopathy in critically ill patients, following their outcome.

METHODS. A prospective study of 35 patients admitted to ICU with a SOFA ≥ 6. Each patient underwent a weekly electromyography. When EMG alterations were detected a muscle biopsy was performed. After ICU discharge the patients were controlled periodically measuring the muscle strength using the MCR scale.

RESULTS. In 22 patients, the first detected EMG alteration was the presence of fibrillation potentials. After electromicroscopic study of the muscle specimen, all of them showed a selective loss of thick (myosin) filaments. Fibrillation appeared within 32 days (average 13). 11 of these 22 patients died. No patient had muscle membrane inexcitability.

Mechanical ventilation average time in the myopathy group was 32 days, in contrast to 13 days among the nonmyopathy group. At ICU discharge all patients with myopathy detected by EMG and biopsy had muscle weakness. The average time to reach full muscle strength was 20 days. Five patients with myopathy who also developed polyneuropathy (identified by loss of all sensory potentials) eventually died.

CONCLUSION. Fibrillation in the EMG is the best method for early and easy detection of CIM. This is directly related to typical pathological changes of CIM. Its onset of change is within the first 2 weeks of illness, and its presence is associated with a prolonged mechanical ventilation time. Full muscle strength is recovered sooner than previously reported.

0524

CRITICAL ILLNESS POLYNEUROPATHY—INCIDENCE, RISK FACTORS, LONG-TERM OUTCOME AND QUALITY OF LIFE

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INTRODUCTION. Critical illness polyneuropathy (CIP) is an axional peripheral neuropathy that leads to severe motorical dysfunction and weakness. CIP is increasingly diagnosed in ICU patients. The incidence of CIP is essentially unknown, as are the risk factors and the outcome of patients with CIP.

OBJECTIVES. We aimed to assess the incidence of CIP and to define potential risk factors for CIP. Moreover, we aimed to assess the long-term outcome of patients with CIP and to assess their quality of life.

METHODS. A database analysis was performed on 1,450 patients admitted to the ICU of a tertiary care hospital within 4.7 years. Diagnosis of CIP was based on clinical judgement and confirmed by electrophysiologic evaluation. Various clinical, laboratory and haemodynamic variables were analysed for prediction of CIP. Outcome and quality of life were assessed in a follow up evaluation by use of structured interview, standardised quality of life scores and clinical neurological examination.

RESULTS. The overall CIP incidence was 3.3% (48 patients) with a continuous annual increase (1.4% in the first year and 5.5% in the fifth year analysed). CIP patients had higher SAPS II scores (53 ± 16 vs. 44 ± 22, $p = 0.01$), were more often mechanically ventilated (48/48 vs. 1,000/1,402, $p = 0.0001$), had a longer duration of mechanical ventilation (median 4 vs. 30 days, $p = 0.0001$), needed more often renal replacement therapy (22/48 vs. 266/1402 patients, $p = 0.0001$) and for a longer period of time (median 4 vs. 11 days, $p = 0.0001$). Moreover, patients with CIP had higher bicarbonate levels on ICU admission and had a longer ICU length of stay (median 5 vs. 36 days, $p = 0.0001$). Evaluating factors associated with CIP in a multivariate model, only high bicarbonate ($p = 0.0016$), duration of renal replacement therapy ($p = 0.043$) and duration of ICU stay ($p = 0.0001$) were independently associated with CIP.

After a median follow up time, 16 of 48 CIP patients underwent follow up evaluation using clinical neurological examination and standardised interview assessing quality of life. All patients had abnormalities in strength, tendon reflexes and sensibility, predominantly affecting the distal parts of the limbs (lower leg in 4/11, arms in 3/11). The deficits were rated at least medium severity. Objective deficits assessed by neurological examination, however, were subjectively noted in only 7 of 11 patients. Moreover, almost half of the patients (7/16) reported on subjective recovery despite persistence of objective signs.

CONCLUSIONS. CIP is diagnosed in approximately 5% of ICU patients. The incidence of CIP is rising, as are severity of the disease and length of the ICU stay, which are associated with the diagnosis of CIP. CIP is characterised by long-term persisting abnormalities in muscle strength. A striking difference, however, is observed between objective assessable clinical deficits and subjective recovery in most patients.

0525

PREHOSPITAL STROKE MEDICAL ACTIVATION: IMPACT ON TIMES RESPONSE AND OUTCOME IN PATIENTS WITH ISCHEMIC STROKE TREATED WITH INTRAVENOUS RECOMBINANT TISSUE PLASMINOGEN ACTIVATOR. PRELIMINARY DATA

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INTRODUCTION. The most important factor in successful thrombolytic treatment of acute ischemic stroke is early treatment. Stroke protocols may have the effect of reducing treatment delays. The aim of this study was to analyse the effect of a prehospital activation protocol in our stroke patients treated with rt-PA.

METHODS. Observational prospective study of all patients with acute ischemic stroke admitted in our ICU and treated with rt-PA (2004–2008). We compare two groups: patients activated by a prehospital care protocol (medicalized ambulance that notified the intensive care team of a thrombolysis candidate and directly transfer patient to the CT scan room) with patients arrived without medical care. We analysed epidemiological data, stroke severity, CT scan findings, treatment timeline (door to interpretation of CT scan and door-to-needle), early clinical improvement and neurological outcome at 3 months using a modified Rankin scale (mRS). Results are expressed as mean or percentage, using a $p < 0.05$ as a significance level. We applied SPSS 15 with "*t*" test for the continuous variables and Chi-square for categorical ones.

RESULTS. We have treated 79 patients, 14 of them with the prehospital protocol activation. No baseline clinical differences were observed between two groups. Times to response were significantly better in the prehospital group. There were no differences in the neurological outcome (early improvement and Rankin at 3 months).The most relevant findings are shown in the following (Table 1).

TABLE 1 PRELIMINARY DATA: PREHOSPITAL MEDICAL ACTIVATION

	Prehospital medical activation ($n = 14$)	No prehospital medical activation ($n = 65$)	*P*
Age (years)	64.4 ± 8.8	65.1 ± 13.5	0.84
Diabetes (%)	0	23	0.06
Baseline NIHSS	14.2 ± 5.8	13.4 ± 4.6	0.57
Early signs on CT (%)	21	30	0.74
Door-to-CT informed (min)	11.7 ± 4.8	39.3 ± 15.34	<0.001
Door-to-needle (min)	54.4 ± 27.1	69.1 ± 24.4	0.04
Early improvement (< 4p NIHSS 48 h) (%)	43	47	0.7
Rankin 3 months (0–2) (%)	50	46	0.41

CONCLUSION. In our series of acute stroke patients treated with rt-PA, a prehospital activation protocol with medicalized care allows a significant reduction in the treatment timeline, mainly door-to-CT scan informed. Despite that our preliminary data show a mild trend in the early signs on CT scan also on mRS, we did not find any statistics significant differences. Additional data will be necessary to confirm the neurological improvement.

0526

PREDICTORS OF BETTER EARLY OUTCOME IN THROMBOLYSED CASES OF ACUTE ISCHEMIC STROKE AT A TERTIARY CARE HOSPITAL

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OBJECTIVES. To analyze the predictors of clinical outcome in thrombolysed cases of acute ischemic stroke in a tertiary care centre.

METHODS. Open, nonrandomized, observational study of 295 patients of stroke admitted from July 2006 to May 2008. Out of these, 205 patients were ischemic, 55 were hemorrhagic and 35 were transient ischemic attack (TIA). Thirty-three (15.6%) patients were thrombolysed, out of which 21 (63.63%) were thrombolysed with intravenous recombinant tissue plasminogen activator (*r*-tPA), 8 (24.24%) underwent sonothrombolysis (continuous transcranial Doppler and *r*-tPA) and 4 (12.12%) patients underwent intra-arterial thrombolysis. Patients were classified using TOAST criteria (large artery atherosclerotic = 10; cardioembolic = 5; small vessel occlusion = 14; other determined etiology = one, undetermined etiology = three). The age ranged from 35 to 75 years (55 ± 18.6). The mean time to reach hospital was 110 min (70–210), the mean door to MRI brain time 16 min (10–30) and mean door to needle time 22.5 min (18–35). Fourteen (42.4%) patients had time to treat less than two h. The mean NIHSS scores were 15.5 ± 6.5 (range 8–22).

RESULTS. Twenty-two patients (66.66%) significantly improved on NIHSS (4 points) (mean change = 8; range = 4–20) at 48 h and seventh day. There was significant recovery ($p < 0.05$) in NIHSS score in patients who had time to treat less than 2 h, sonothrombolysed, age <60 years, better blood pressure, sugar control and NIHSS score <15. One each developed small parietal lobe hemorrhage and recurrent stroke and five (15.2%) showed no improvement. There was no mortality.

CONCLUSIONS. Outcome in thrombolysed patients can be improved by reducing the time to treat, better control of blood pressure, sugar and sonothrombolysis.

0527

OUTCOME OF PATIENTS WITH STATUS EPILEPTICUS TREATED WITH INTRAVENOUS LEVETIRACETAM

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INTRODUCTION. Status epilepticus carries a mortality rate up to 77% depending on underlying cause, age, and time to treatment success. Benzodiazepines and phenytoin as first and second line agents are effective in terminating status epilepticus in only 31–56%. Newer antiepileptic agents with less side effects might be powerful adjunctive therapies. We would like to report our experiences with IV levetiracetam as second line agent in a treatment protocol for a prospective patient cohort with status epilepticus.

METHODS. We treated 17 patients with convulsive status epilepticus between January 2007 and April 2008 with an institutional treatment protocol consisting of IV lorazepam as first line agent, IV phenytoin as second line agent, followed by IV levetiracetam as third line agent or second line agent if there were contraindications for IV phenytoin. If the status epilepticus could not be terminated by IV levetiracetam, IV propofol and/or midazolam were applied as continuous infusion under EEG monitoring. Primary outcome was treatment success of IV levetiracetam. Secondary outcome measures were time to treatment success defined as termination of clinical and electrographic status epilepticus, modified Rankin Scale (mRS) at 6 and 12 months, and complications.

RESULTS. Of the 17 patients 13 (76%) had cerebral structural abnormalities such as remote or acute infarction, hemorrhage, brain tumor, hippocampal sclerosis, neonatal hypoxic brain injury as underlying etiology for status epilepticus, the cause was infection in 3 (18%) patients, and hyponatremia in 1 patient (1%). Median age was 72 (range 33–88) years. IV levetiracetam resulted in successful in termination of status epilepticus in 2 (12%) patients. The treatment was continued with midazolam and/or propofol infusions in 15 (88%) patients. Median time to treatment success was 373.5 (24–16337) min in all patients, 5 and 16,337 min in the 2 patients successfully treated with IV levetiracetam. One patient died while still in status epilepticus. At 6 months, 5 (29%) patients had died, support had been actively withdrawn in 1 patient. The mRS was 0 in 2 patients, 1 in 4 patients, 2 in 1 patient, 3 in 2 patients, 4 in 2 patients and 5 in 1 patient. At 12 months, 1 patient with an mRS of 3 had progressed to 4, the other patients had remained in the same functional state. The most common complications included hyperglycemia (71%), hypotension (71%), acute renal failure (29%), pulmonary edema (29%) and anemia (29%), thrombocytopenia (24%), pneumonia (24%), seizure recurrence (24%), urinary tract infection (18%), septic shock (12%), and cardiac arrest (2%).

CONCLUSION. Levetiracetam offers a feasible alternative strategy to break status epilepticus as adjunctive third line therapy in a paucity of patients before administration of sedatives with a broad spectrum of adverse effects and needs to be studied in a standardized trial.

0528

USE AND OUTCOMES OF ELECTROENCEPHALOGRAPHY IN AN ADULT GENERAL INTENSIVE CARE UNIT. A 6 YEAR EXPERIENCE

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INTRODUCTION. EEG is rapid and safe test, which assesses the thalamocortical function in comatose patients [1]. However, EEG patterns can be nonspecific and their interpretation can be hampered with artifacts or use of sedation. Our aim was to assess the diagnostic yield and outcomes of EEG in critically ill population in our intensive care unit.

METHODS. We audited all EEG results generated between January 2003–December 2008. Clinical, demographic and mortality data was collected.

RESULTS. A total of 96 EEG reports were generated from 74 patients admitted over a 6 year period. Mean age of patient was 49 ± 31 years. 29.7% ($n = 22$) were female. 44.5% patients ($n = 33$) had a preceding cardiorespiratory arrest. 12.1% ($n = 9$) had a history of traumatic brain injury. 40.5% ($n = 30$) patients were not on any sedation. The most common diagnostic indication was to diagnose seizures ($n = 38$), followed by HIE ($n = 26$), and encephalopathy ($n = 15$). Other indications for requesting EEG included assessment of coma ($n = 6$), delay in waking up ($n = 4$), encephalitis ($n = 7$), confusion ($n = 4$), follow up ($n = 5$), abnormal movements ($n = 1$). Many EEG requests had multiple indications. Only 3.1% ($n = 3$) EEG's were normal. 24% ($n = 25$) were inconclusive because of effect of sedation or machine/muscle artifacts. The overall diagnostic yield of EEG in this population was 73.95%

Table 1 The incidence of HIE was 14.5%. 8.1% ($n = 6$) EEG's, performed on 5 patients with no history of cardio respiratory arrest had features of HIE. *P* value was 0.0099 using Fischer's extract test. (See Table 2)

TABLE 1 OUTCOME OF ALL EEGS

Clinical Indication	Number (*n*)	Positive *n* (%)	Alternative diagnosis (*n*)	Inconclusive (*n*)
HIE	26	14 (53.8%)	$n = 8$. isoelectric EEG = 8, Normal = 2, encephalopathy = 4	4
Seizures	38	11 (28.1%)	$n = 14$. alpha coma = 2, encephalitis = 1, encephalopathy = 8, severely abnormal = 3	13
Encephalopathy	15	12 (80%)	$n = 1$. normal = 1	2
Encephalitis	7	1 (14.2%)	$n = 4$ encephalopathy = 3 seizure = 1	3
Low GCS/confusion/ not waking up	20	17 (85%)	0	3

TABLE 2

	HIE	NO HIE
EEG with h/o CPR	14	27
EEG with no h/o CPR	6	49

38 EEG's were requested to diagnose seizures of which 28.1% ($n = 11$) had the diagnosis confirmed. Incidence of epileptiform activity on EEG was 11.4%. 6.7% ($n = 5$) patients had no history of epilepsy documented but had evidence of nonconvulsive status epilepticus on their EEG. Diagnosis of encephalopathy was made in 28.12% ($n = 27$) EEG's of which 15 EEG's had a coincidental diagnosis. Thirty day mortality of patients who had an EEG was 54.05% ($n = 40$).

CONCLUSION. EEG had a high diagnostic yield (73.95%) in our population. A statistically significant finding was an 8.1% incidence of hypoxic ischaemic encephalopathy in patients with no history of preceding cardiorespiratory arrest. There was a high incidence of inconclusive EEG's (24%) due to sedation or muscle/machine artefacts.

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0529

PREDICTION OF OUTCOME AFTER CARDIAC ARREST AND INDUCED HYPOTHERMIA

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INTRODUCTION. Prediction of outcome in comatose survivors after cardiac arrest (CA) is difficult and is further complicated with the introduction of hypothermia as a treatment option, since sedation and intermittent use of muscle relaxants are mandated. Other means of prognostication, unaffected by pharmaceuticals, are warranted. We present data from a coma project, where the aim was to evaluate prognostic means by themselves or in combination.

METHODS. A retrospective analysis of all patients in the Intensive Care Unit at Lund University Hospital included to hypothermia treatment after CA, 2004–2008. Hypothermia treatment was performed regardless of initial rhythm or location of arrest. A standardised protocol for monitoring and evaluation of neurological function and outcome was used. All patients were monitored with continuous amplitude integrated EEG (aEEG) during hypothermia until recovery of consciousness, death or maximum 120 h after the CA. Serum samples of NSE were collected at 24, 48 and 72 h after the CA. Patients were assessed neurologically and an SSEP was performed at 72 h after normothermia. A decision on level of care was based upon the result of the neurological examination and SSEP.

RESULTS. During a 4-year period, 106 consecutive patients were included; 19 were excluded because of death prior to evaluation (15), protocol violation (3) and intracerebral bleeding (1). Of the remaining 87 patients, 50 patients regained consciousness within 72 h after normothermia and 37 patients were still in coma (GCS $\leq$ 7). Among these 37 patients, 8 patients eventually regained consciousness, whereas 29 did not. Our 8 patients with a late recovery had a positive profile regarding aEEG (continuous pattern), NSE (<28 μg/L at 48 h) and SSEP (cortical response), whereas 27 of 29 patients with persisting coma had at least one other strong marker for a poor outcome.

CONCLUSION. A decision on level of care after cardiac arrest should be based on a neurological examination (GCS $\leq$ 7) and at least one other prognostic tool. This should be performed no earlier than 72 h after normothermia.

0530

AN AUDIT OF THE OUTCOMES FOR THERAPEUTIC HYPOTHERMIA FOLLOWING CARDIAC ARREST

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AIMS. Therapeutic hypothermia as a protective strategy for brain injury has been known since the 1950. Recently, it re-emerged following two prospective randomized controlled trials published in 2002 [1, 2]. They highlighted the potential benefit in patients who suffered out of hospital cardiac arrest with a presenting rhythm of either ventricular fibrillation (VF) or ventricular tachycardia (VT). The benefit was generally in neurological outcome. Therapeutic hypothermia is now provided at University Hospital Lewisham, London for all patients post cardiac arrest, regardless of rhythm. Therefore, a retrospective audit of our practice, outcomes and complications was carried out.

METHOD. We retrospectively identified patients who underwent therapeutic hypothermia post cardiac arrest from August 2007 to January 2009. The notes were analysed and data collected using a proforma. The information collected was: patient demographics; presenting rhythm; time to cardio-pulmonary resuscitation (CPR); duration of CPR; resuscitation drugs administered; time to initiate cooling; time to target temperature; time at target temperature; peak temperature following re-warming; complications and outcome in terms of morbidity and mortality.

RESULTS. 21 patients underwent therapeutic hypothermia post cardiac arrest, of whom 8 patients survived to hospital discharge. Over half the cardiac arrests occurred in hospital. The average time to initiation of CPR was 2 min. The most common rhythm was pulseless electrical activity (PEA) at 43%. The mean CPR time was 15 min with a mean number of DC shocks of 1.3. The mean time to target temperature was 490 min with an average of 22 h spent at this temperature. There was no significant bleeding. 36% of patients required renal support, 21% became septic post arrest, 36% developed pneumonia and 21% developed an arrhythmia requiring treatment.

DISCUSSION. 38% of patients, who had a return of spontaneous circulation following cardiac arrest that underwent therapeutic hypothermia, survived to hospital discharge. Normal survival rates from ITU are between 25 and 35% [3]. Interestingly, this was despite its application to all comers and the seemingly prolonged time to initiate cooling and subsequently the time to attain target temperature. This highlighted an area for development in our practice. Our results are encouraging for the wider implementation of therapeutic hypothermia.

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0531

ONE YEAR REVIEW OF IN-HOSPITAL CARDIAC ARRESTS IN AN ACADEMIC HOSPITAL IN BELGIUM

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INTRODUCTION. The outcome from in-hospital cardiac arrests is variable but some physiological alterations may be recognized in the hours preceding the arrest and serve as criteria for early warning.

MATERIAL AND METHODS. Review over a 1-year period of 246 emergency calls in a 858 bed academic hospital.

RESULTS. A total of 54 patients (22%) had cardiorespiratory arrest: CPR was performed in 46 of them (85%) of whom 19 could be resuscitated (41%): 13 were resuscitated, but died in hospital within 48 h (28%) so that only 6 (13%) were discharged from hospital. One or more significant physiological changes were detected in 68% of cases. By univariable logistic regression, significant predictors of cardiac arrest were abnormal breathing (OR:4.53–$p = 0.01$), a decrease in SpO_2 (OR: 5.68, p:0.015), a change in heart rate (OR: 4.83, p: 0.004), a change in systolic blood pressure (OR: 3.15, p:0.01), occurrence of chest pain (OR:11.79, p: 0.02) and altered consciousness (OR: 4.26, p: 0.008).

CONCLUSION. Outcome from in-hospital cardiac arrest is poor. A better recognition of some physiological changes in the preceding hours could prevent the cardiac arrest.

0532

THE GAMMA ISOFORM OF ENOLASE (NSE) IS PREDICTIVE OF MORTALITY AFTER CARDIOPULMONARY RESUSCITATION (CPR): COMPARISON WITH CLINICAL NEUROLOGIC EXAMINATION AND CT SCAN OF THE BRAIN

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OBJECTIVE. To assess the prognostic value of neuron-specific enolase (NSE) for early prediction of outcome in patients at risk for anoxic encephalopathy after cardiopulmonary resuscitation (CPR) and to compare NSE with conventional risk indicators—neurological examination and computed tomography of the brain (CT).

DESIGN. Prospective study. Patients: 31 patients (age 63.7 + 16.7 years [SD]) after CPR due to different reasons.

METHODS. Blood sample on the third day after CPR, CT, neurological examination and documentation of myoclonia. Patients were categorized into four groups (A = those who died, B = survivors, C = those with a neurologic deficit and/or those who died, D = survivors without any neurologic deficit).

RESULTS. NSE-plasma levels of group D differed significantly from group A and C. (D: 15.66 + 8.79 ng/ml versus A: 75.11 + 65.3; $p = 0.02$; versus C: 72.82 + 67.16; $p = 0.01$). There were no significant differences concerning neurologic examination and the findings of CT. NSE measurements reached a sensitivity of 0.95 and a specificity of 0.5 to predict hypoxic ischaemic brain damage. CT scan could be performed in only 51.6%. The neurologic examination showed that no patient was without neurologic deficit 3 days after successful resuscitation.

CONCLUSION. Non-elevated NSE-levels mean a complete neurologic restitution whereas elevated NSE-levels do not exclude a restitution. Determination of NSE is ideal as a reliable and convenient parameter for estimation the neurologic outcome after CPR in comparison to CT, neurologic examination and the existence of myclonia and can make the process of individual decision easier because of its simplicity in daily routine of intensive care.

0533

THE USE OF LIPID EMULSION IN THE MANAGEMENT OF CARDIAC ARREST SECONDARY TO LOCAL ANAESTHETIC TOXICITY: AN ONLINE QUESTIONNAIRE SURVEY OF RESUSCITATION OFFICERS OF THE UK

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INTRODUCTION. Local anaesthetic (LA) toxicity can lead to resistant cardiac arrest. The use of lipid emulsion, when added to standard resuscitation protocols or procedures, can result in improved outcome. Guidelines by Association of Anaesthetists of Great Britain and Ireland and a statement from the Resuscitation Council (UK) have been issued in this regard. In this survey, we asked resuscitation officers about their awareness of local anaesthetic toxicity and the use of lipid emulsion to treat it. Resuscitation officers (ROs) have a vital role in teaching and training resuscitation techniques, and are therefore well placed to cascade information about management of LA toxicity.

OBJECTIVES. Explore the awareness and involvement of ROs in the implementation and dissemination of guidelines for management of LA toxicity.

METHODS. The electronic survey was carried out by sending the survey link to the web site (http://www.surveymethods.com) by email to all the ROs registered with Council for Professionals as Resuscitation Officers (CPRO) UK. Three reminders at intervals of approximately 3 weeks were sent to non-responders.

RESULTS. Survey was sent to 423 addresses and a 60% response rate was obtained.

- ~35% participants were not aware of any guidelines
- ~57% followed AAGBI or local guidelines.
- ~40% were not sure about the use of lipid emulsion in LA toxicity
- ~58% would use lipid emulsion in LA toxicity.
- ~60% were not aware of the whereabouts of Lipid emulsion in their clinical areas.
- 57.2% reported either not having or not knowing of a system in place for making lipid emulsion available in high risk areas in their trust.
- Cardio pulmonary bypass (CPB) was available and considered an option by only 7.8% respondents.
- >80% participants were of the view that RC (UK) should produce guidance to deal with LA induced cardiac arrest.

CONCLUSIONS. There is a need to increase awareness of the use of lipid emulsion (especially amongst non-anaesthetists) and its availability for emergency use.

RECOMMENDATIONS.

1. Increase awareness, especially amongst non-anaesthetists, of the role of lipid emulsion in the management of LA toxicity and cases of resistant cardiac arrest from overdose of lipid soluble drugs.
2. More widespread availability of lipid emulsion - including in emergency departments.
3. A multi disciplinary team approach to tackle this issue jointly by hospital pharmacy and departments of anaesthesia and resuscitation training.
4. Recommendation to Resuscitation Council, UK to add lipid emulsion to the special circumstances workshop for poisoning on resuscitation courses.

REFERENCES. 1. Association of Anaesthetists of Great Britain and Ireland (2007) Guidelines for the management of severe local anaesthetic toxicity. http://www.aagbi.org/publications/guidelines/docs/latoxicity07.pdf. 2. http://www.resus.org.uk/pages/caLocalA.htm. 3. Picard J et al (2009) Lipid emulsion to treat drug overdose: past, present and future. Anaesthesia

0534

CHECKING OF PUPILS FROM THE HEAD END OF PATIENT DURING A LAND AMBULANCE TRANSFER

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BACKGROUND. Referral of an acute traumatic brain injured patient to a tertiary neuroscience centre is one of the most common indications for inter hospital transfer in the UK. With no facility available for ICP monitoring during the ambulance transfer, the only indicator of critically high intracranial tension is pupillary signs as most patients are pharmacologically paralysed. National guidelines recommend checking pupils during such a transfer [1]. Ambulance trolleys designed to transport critically ill patients are higher than standard trolleys because of monitors and ventilators housed under them and the head end is additionally raised 20° to facilitate cerebral venous drainage. Standing up in a moving ambulance increases risk to and invalidates the insurance cover of the transferring personnel.

OBJECTIVE. To determine whether it is possible to check a patient's pupils while sitting at the head end during a land ambulance transfer.

MATERIALS AND METHODS. After ethics approval 26 volunteers were recruited in a transfer course organised by the Mid Trent Critical Care Network, UK. Participants were invited to check the pupils of a manikin strapped to a trolley using a standard ICU pen torch, by sitting on the head side of the trolley without removing their seat belt. The trolley used was Falcon 6 [Ferno (UK) Ltd] modified to critical care transfer specification. Participants and two trained observers were asked to separately assess the difficulty of seeing the pupils using three point scale (1 = impossible, 2 = with difficulty, 3 = easy). Descriptive analysis was done of the observations. Height and gender were compared using Chi-square test.

RESULTS. All 26 subjects (12 male and 14 female) completed the task. Average height of the participants was 168.2 cm (±9.6). Participants' subjective assessment were well correlated to the observer assessment ($R^2 = 0.9$, $P < 0.01$). 13 (50%) participants found the task impossible to perform, compared to only 6 (23%) who found it easy. Height and gender had no influence on the ability to check the pupils ($P < 0.05$).

CONCLUSIONS. Height did not statistically correlate with the ability to check pupils whilst seated. However, there was a trend that taller participants found the task easier. Although half of the participants could not perform the task it was possible for some to check pupils while seated with the seat belt on. Amalgamating these facts with the importance of assessing pupils raises the question whether training in pupil assessment whilst restrained during transfer might make a difference. Although this was a pilot study, our results may suggest reviewing the current guidelines, so paramedics, who are covered to work in a moving vehicle unrestrained, should check patients' pupils instead, or make an issue for change of ambulance design.

REFERENCE. 1. AAGBI (2006) Recommendations for the safe transfer of patients with brain injury. http://www.aagbi.org/publications/guidelines/docs/braininjury.pdf.

0535

FATAL HYPOGLYCEMIA; CT AND MR FINDINGS OF THE BRAIN

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INTRODUCTION. Changes in the human brain due to after severe hypoglycemia are relatively unknown since few reports on imaging studies are available in the literature. In this case report, we describe both the CT scan and MR findings in a patient with severe hypoglycaemic coma, illustrating the unique changes in the brain. Knowledge of possible findings is important, because of their substantial prognostic impact.

METHODS. Case report.

RESULTS. A 22-year-old woman with borderline personality disorder, was admitted to our hospital after being found at home in an unresponsive state. Paramedics measured a glucose level <1.0 mmol/L and administered 50 ml glucose 50% intravenously, without improvement of consciousness. On arrival in hospital, the patient was comatose; Glasgow Coma Score E1M2V1. Blood pressure was 100/60 mmHg and heart rate 60/min. Respiration was regular with a peripheral saturation of 100% with a non-rebreathing mask. The temperature was 35.7°C. Initially, patient showed mid-sized isocore pupils, both reactive to light. Glucose level at admission was 11.9 mmol/L. Physical examination revealed several small skin lesions in the abdominal wall, compatible the suspicion of multiple insulin injections. This was evidenced by an insulin level of 14.3 with a C-peptide level <0.03. To antagonise a potential opoid or benzodiazepine intoxication, flumazenil and naloxon were given intravenously, but without any effect. Toxicology screening proved negative, apart from a very low urine concentration of benzodiazepines. Patient was intubated. Thirty minutes after admission to the ICU patient showed anisocore pupils developed. A CT scan of the brain showed low attenuation of the brain with loss of gray-white matter differentiation and swelling, most pronounced in the frontotemporal lobes. A bright cerebellair sign was noted. In spite of continuous glucose monitoring, hypoglycemia re-occurred three times during first 12 h. Twenty-four hours after admission, the Glasgow Coma Scale remained unchanged, and had developed bilateral wide, unresponsive pupils. Subsequent MR revealed pronounced symmetric bilateral hyperintensity of the basal ganglia, hippocampus and parts of the thalamus with restricted diffusion. Also hyperintensity of the cerebral cortex, with diffuse swelling of the brain was noted, with compression of the brainstem, consistent with herniation. Because prognosis was considered dismal, therapy was subsequently withdrawn.

CONCLUSION. Our patient suffered severe brain injury due to severe hypoglycemia after insulin overdose. MR findings after severe hypoglycemicia can serve as a prognostic factor and assist in clinical decision-making. Only cortical changes and swelling of the brain have a relative good outcome, whereas involvement of basal ganglia and hippocampus, as present in our patient, is indicative of poor outcome, resulting in death or survival in a persistent vegetative state.

0536

SUICIDAL HANGING: IS IT THE END OF THE ROAD? AN INDIAN EXPERIENCE

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AIM. To analyse incidence of mortality and identify predictors of mortality in patients admitted with suicidal hanging.

METHODS. We performed a retrospective analysis of all patients with suicidal hanging admitted to our ICU from January 2006 to February 2009. Primary outcome was in hospital mortality. Secondary outcomes—ICU Length of stay (LOS), Hospital LOS, ICU free days, Ventilator days and Ventilator free days. Admission data included demographics, mode of hanging, lead time to ER admission, clinical presentation including vital parameters, ABG and relevant imaging studies. Admission APACHE II, GCS, SOFA, 48 h SOFA, and need for vasopressors were documented. Statistical analysis: Fischer's exact test, students *t* test and logistic regression. $p < 0.05$ significant.

RESULTS. Of the 44 patients included, 25 were females and 19 males. Mean age was 28.8 ± 11.6 years (Mean ± SD). Lead time to ER admission was 2.22 ± 3.92 h. Mortality was 17% ($n = 7$). Observations at admission were loss of consciousness 93%, seizures 23%, restlessness 30% and vomiting in 9%. 43% had systolic BP ≤ 90 and 20% required inotropic support within first 24 h. Admission Lactate ($n = 23$) was 2.6 ± 1.1 mmol/L. Intubation was required in 84% ($n = 37$). CT brain abnormalities (23%) included diffuse cerebral edema, subarachnoid hemorrhage, petecheal hemorrhage and fracture occiput. None had spinal injuries. Clinical and radiological evidence of pulmonary edema was present in 23% ($n = 10$) in whom mortality was 43% ($n = 3$). Stress cardiomyopathy diagnosed by echocardiogram was seen in four patients.

80% presented with GCS < 8. GCS normalised in 2.2 ± 4.1 days, while in 54% this took less than 24 h.

CONCLUSION. Suicidal hanging is associated with significant mortality. Predictors of poor outcome in our study were admission GCS and SOFA at 48 h. Survivors stayed shorter in ICU and on the ventilator (Tables 1, 2, 3)

TABLE 1 SEVERITY OF ILLNESS SCORE AND BASE DEFICIT

	Study group (n 44) Mean ± SD	Survivors (n 37)	Nonsurvivors (n 7)	P Value
APACHE II admission	19.68 ± 7.42	18.49 ± 7.17	26.00 ± 5.47	0.01
SOFA admission	5.86 ± 2.59	5.58 ± 2.61	7.29 ± 1.89	0.10
SOFA 48 h	1.47 ± 2.53	0.78 ± 1.39	5.67 ± 3.93	0.00
GCS admission	6.27 ± 3.89	6.76 ± 4.05	3.71 ± 1.11	0.05
Base Deficit admission	−6.45 ± 4.62	−5.79 ± 4.46	−9.90 ± 4.41	0.02
Base Deficit after 24 h	−1.60 ± 4.82	−0.98 ± 4.04	−5.33 ± 7.56	0.03

Severity of illness score and base deficit

TABLE 2 SECONDARY OUTCOMES

	Study group (n 44) Mean ± SD	Survivors (n 37)	Nonsurvivors (n 7)	P Value
Hospital stay (days)	6.50 ± 5.27	6.43 ± 5.27	6.86 ± 5.69	0.8
ICU LOS (days)	4.10 ± 3.67	3.58 ± 2.99	6.86 ± 5.69	0.02
ICU free days	2.38 ± 2.59	2.82 ± 2.59	0.0	0.007
Ventilator days	2.64 ± 3.41	1.86 ± 2.09	6.81 ± 5.75	0.000
Ventilator free days	3.44 ± 3.79	4.64 ± 3.94	0.0	0.004

Secondary outcomes

TABLE 3 MULTIVARIATE ANALYSIS

	P value	95% CI
GCS admission	0.046	1.09–46.5
APACHE II	0.08	0.44–1.05
SOFA admission	0.74	0.37–2.04
Base Deficit admission	0.055	0.99–1.51
Base Deficit after 24 h	0.79	0.97–1.50
SOFA 48 h	0.74	0.26–0.80
ICU LOS	0.04	0.67–0.99
Ventilator days	0.007	0.56–0.91

Multivariate analysis

Cardiac arrest and brain damage: 0537–0550

0537

ICP MONITORING DURING HYPOTHERMIA AFTER CARDIOPULMONARY RESUSCITATION

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INTRODUCTION. Two randomized clinical trials explored that induced hypothermia improved outcomes in adults with coma after resuscitation from ventricular fibrillation. In this study, we will present the usefulness of intracranial pressure (ICP) monitoring to predict the patient's outcome after induced hypothermia

METHODS. Hypothermia (34°C, 48 h) was induced in patients after the recovery of spontaneous circulation. The indication was as follows: motor response of GCS $\leqq$ 5, intact at least one of brain stem reflexes and age 15–80 years. ICP and SjO_2 monitoring were performed during hypothermia.

RESULTS. Hypothermia was induced in 23 patient's (55%) after resuscitation. The outcome of nine patients (39%) were modified Rankin Scale 0–2, 11 (48%) were 3–5 and 3 (13%) were dead. ICP during hypothermia did not increase beyond 10 mmHg in neurologically good outcome patients (Fig. 1). SjO_2 tended to be less than 80% in neurologically good outcome patients (Fig. 2).

CONCLUSIONS. ICP monitoring during hypothermia was extremely useful to predict the patient's outcome. SjO_2 monitoring during hypothermia was also predictable about the patient's outcome.

REFERENCES. 1. Bernard SA et al (2002) N Engl J Med 346:557–563. 2. Dixon SR, et al (2002) J Am Coll Cardiol 40:1928–1934

0538

AUDIT OF OUTCOME OF PATIENTS ADMITTED TO ITU FOLLOWING EITHER IN OR OUT OF HOSPITAL CARDIAC ARREST

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INTRODUCTION. Therapeutic hypothermia has been demonstrated to improve outcome when instituted in patients following cardiac arrest. Previously this has only been recommended for pulseless VT or VF cardiac arrests occurring in the community. Guidelines for the use of therapeutic hypothermia at Sheffield Teaching Hospitals (STH) were introduced in January 2008. Inclusion criteria for these guidelines incorporate all patients following cardiac arrest, regardless of initial rhythm or location of arrest.

OBJECTIVES.

- To review the case mix of post-arrest patients admitted to the ITU at the Northern General Hospital, STH.
- To assess how often therapeutic hypothermia is being instituted when indicated.
- To record patient outcomes following ITU admission.
- To assess the utility of the PAR score in predicting outcome in patients admitted to ITU following cardiac arrest.

METHODS. For all patients admitted to the ITU following cardiac arrest from May 2006–May 2008 the following was recorded:

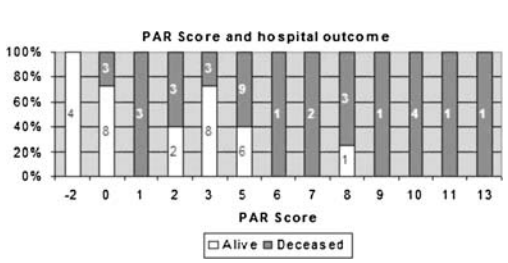
- Location of cardiac arrest.
- Did patient fulfil criteria for therapeutic hypothermia?
- Was therapeutic hypothermia initiated?
- Prognosis after resuscitation (PAR) score.
- Outcome at hospital discharge.

RESULTS. 66 patients were admitted to ITU following cardiac arrest from May 2006 until 2008. 29 of 66 patients (44%) had their cardiac arrest in the community. The three most common locations for in-patient cardiac arrests were renal wards (8 patients), A&E (6 patients) and the Medical Assessment Unit (5 patients).

41 patients fulfilled criteria for therapeutic hypothermia, 23 (56%) received this therapy. The proportion of patients fulfilling criteria treated with therapeutic hypothermia improved from 2006 (30%) to 2008 (56%).

30 patients in total (45%) survived to hospital discharge. Survival was the same for cardiac arrests occurring in the community and in-hospital. Only one patient with a PAR score of 6 or greater survived.

CONCLUSIONS. 45% of the patients admitted to the ITU following cardiac arrest survived to hospital discharge. This has improved compared to data collected locally for 2001–2005 (survival 30%). The appropriate use of therapeutic hypothermia improved following introduction of trust guidelines. The PAR score appears to be a useful predictor of non-survival in patients admitted to ITU following cardiac arrest.



PAR score and hospital outcome

REFERENCES. Ebell MH (1992) Prearrest predictors of survival following in-hospital cardiopulmonary resuscitation: a meta-analysis. J Fam Pract 34:551–558.

0539

THERAPEUTIC HYPOTHERMIA AFTER OUT OF HOSPITAL CARDIAC ARREST: A RETROSPECTIVE AUDIT OF PRACTICE AFTER INTRODUCTION OF A PROTOCOL

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INTRODUCTION. Therapeutic hypothermia is recommended for prevention of brain injury in out of hospital VF cardiac arrest. It should be started as soon as possible and continued for at least 12–24 h at 32–34°C [1]. Local audit in 2006 led to the introduction of a protocol for this therapy [2].

OBJECTIVES. To audit the protocol effectiveness.

METHODS. A retrospective audit was conducted of all admissions after cardiac arrest to critical care in 12 months in 2008. Data regarding cooling, cardiac arrest and outcome was recorded.

RESULTS. 73 people were admitted after cardiac arrest. 41 were out of hospital arrests and 32 in-hospital.

28 patients underwent therapeutic hypothermia after an out of hospital cardiac arrest. Cooling methods included wet towels, ice packs, cold intravenous fluids and fans. The intravascular cooling device was not yet purchased. 100% of eligible out of hospital VF/VT cardiac arrests underwent attempted therapeutic hypothermia. 35% of out of hospital PEA or Asystole cardiac arrests underwent therapeutic hypothermia.

Only 8 patients (28%) were within the target temperature range (32–34°C) for at least 12 h. 15 patients (53%) had rebound hyperthermia within 48 h. 11 patients had clearly recorded commencement of therapeutic hypothermia. Of these, 45% had therapeutic hypothermia initiated in the emergency department (ED).

Overall survival to leave hospital was 37.9% of all patients treated with therapeutic hypothermia. In the VF/VT group survival was 52.3% ($n = 11$). Survival in the non-VF/VT group was 12.5% ($n = 1$).

CONCLUSIONS. In the 2006 audit [2] only 60% of eligible out of hospital VF/VT arrests underwent therapeutic hypothermia. Introduction of a protocol has improved this to 100%. Survival in 2006 [2] in the VF/VT group who underwent therapeutic hypothermia was 50% and remains similar in this audit. Survival of PEA and Asystole is consistently poor and consideration should be made only to cool under exceptional circumstances. Cooling should be initiated in ED and the protocol needs more successful implementation here.

Achieving target temperature for at least 12 h is difficult using surface methods and rebound hyperthermia is common. A protocol can ensure eligible patients undergo therapeutic hypothermia but new equipment is needed to optimise cooling. We have recently purchased a new intravascular cooling device to address these problems and are conducting a prospective audit of its use (Table 1)

TABLE 1 OUT OF HOSPITAL CARDIAC ARRESTS ADMITTED

	PEA or Asystole	VF/VT
Number admitted	20	21
Number admitted who underwent attempted therapeutic hypothermia.	7	21

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0540

MOTOR RESPONSE TO PAIN AS AN OUTCOME PREDICTIVE FACTOR AFTER CARDIAC ARREST

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INTRODUCTION. Some patient do not regain consciousness despite return of spontaneous circulation (ROSC) after cardiac arrest (CA). In these patients prognosis can be predicted after 2–3 days (1–2).

OBJECTIVES. To evaluate GCS > 3 at day 3 as an outcome predictive factor in patients admitted to our Intensive Care Unit (ICU) after CA.

METHODS. We enrolled all patient to be admitted to the ICU after CA. We recorded time (in minutes) from CA to the beginning of Basic Life Support (time CA-BLS) and time from CA to ROSC (time CA-ROSC). Neurological examination was performed for 3 days to evaluate the pupillary response to light and the motor response to pain (GCSm). Survival at ICU discharge and at 6 months was recorded. Favorable neurologic outcome was evaluated with the Pittsburgh Cerebral Performance Category (CPC). Good outcome was defined as good cerebral performance (CPC 1) or moderate cerebral disability (CPC 2).

RESULTS. From January 2005 to October 2008 we enrolled 58 patients (age 62 $\pm$ 15, F/M = 24/34), 27 out-of-hospital CA (OHCA) e 31 inhospital Cardiac Arrest (IHCA). Eight patients died within 24 h after admission. In two patients CPC was not recorded. At day 3: 27 patients had a GCSm $\leq$3 (group 1). 21 patients had a GCSm >3 (group 2). *Z*-test was used to compare proportions between group 1 and 2. More results are shown in the Table 1 below.

TABLE 1

	GCSm $\leq$ 3 (Group 1)	GCSm > 3 (Group 2)
Number of patients	27 (11 IHCA)	21 (14 IHCA)
Pupillary response to light	21 (78%)	21 (100%)
Survival to ICU discharge	8 (29.6%)	21 (100%)*
Survival to 6 months	2 (7.4%)	18 (85%)*
CPC 1–2	2 (8%)	18 (86%)*
Time ACC-BLS	4.8 min	0.7 min
Time ACC ROSC	22.6 min	13 min

* $p < 0.001$

CONCLUSION. Our result confirms that the motor response to pain at day 3 after CA is a strong outcome predictive factor of death or poor neurological outcome. Also, patients showing GCSm >3 had shorter no-flow time compared to patients showing GCSm $\leq$3.

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0541

USE OF A STANDARDIZED ORDER SET FOR MILD THERAPEUTIC HYPOTHERMIA AFTER CARDIAC ARREST: AN EASY AND INEXPENSIVE TECHNIQUE

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INTRODUCTION. Mild therapeutic hypothermia (MTH) has become a standard of care in comatose survivors of out-of-hospital cardiac arrest (OHCA) [1, 2]. However, those processes are cumbersome and needed of special technique. Moreover, the special cooling resources are expensive.

OBJECTIVES. We made the standardized order set for MTH using easily available, low-cost Intensive Care Unit (ICU) resources. We consider the neurological outcome and cost to give an assessment of our order set.

METHODS. We retrospectively studied 19 OHCA survivors that were treated with MTH in our ICU from 2006 to 2008 with regard to cerebral performance category (CPC) at hospital discharge. 19 comatose post-cardiac arrest/post-anoxic event patients were cooled to a target temperature range of 32–34°C and maintained in target range for 24–36 h with traditional water circulating cooling blankets. Cooling was begun immediately upon arrival to the emergency room by rapid intravenous infusion of 40 ml/kg 4°C bicarbonated Ringer's solution. Favorable outcome was defined as good cerebral performance (CPC1) and moderate cerebral disability (CPC2).

RESULTS. There were 19 patients (12 male, 7 female) in coma after cardiac arrest or anoxia event with an average age of 56.5 years. Time to reach target range after induction of cooling modalities averaged 144 min. Time to reach target range from resumption of spontaneous circulation (ROSC) averaged 241 min. Neurological outcomes were 9 cases in CPC1 (47.5%), 2 cases in CPC2 (10.5%), 2 cases in CPC3 (10.5%), 1 case in CPC4 (5.3%), and 5 cases in CPC5 (26.5%). Favorable outcome was 11 cases (57.9%). Cost of materials was approximately 100 Euros per patient.

CONCLUSIONS. Our standardized order set can be induced with easily available and low-cost ICU resources. We reported favorable outcomes which were almost same as already reported [1]. These results suggest that MTH will potentially become widespread even at small ICU by our standardized order set.

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0542

SOMATOSENSORY EVOKED POTENTIALS IN PREDICTION OF INDIVIDUAL OUTCOME IN UNCONSCIOUS CARDIAC ARREST SURVIVORS

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INTRODUCTION. Somatosensory evoked potentials (SEP) is the method with the highest prognostic reliability in unconscious cardiac arrest survivors. Whereas bilaterally absent N20 peak predicts bad outcome with a specificity of 100%, the sensitivity of the N20 peak is low. Additional recording of the N70 peak increases prognostic accuracy. In this study we assessed the prognostic accuracy for the N20 peak and for different cut-off points of the N70 peak.

METHODS. SEP were recorded within 24 and 72 h after cardiac arrest. We included 448 unconscious patients after successful cardiopulmonary resuscitation. One year after cardiac arrest, final outcome was assessed and severe disability, persistent vegetative state or death, were defined as bad outcome. Sensitivity (good outcome which has classified correctly) specificity (bad outcome which was classified correctly) and negative predictive value (NPV) and positive predictive value (PPV) of the N20 and N70 peak latency were calculated.

RESULTS. One year after cardiac arrest, 322 (72%) patients were classified as bad outcome. All patients with bilaterally absent N20 peak ($n = 129$; 29%) had bad outcome. The predictive accuracy of an absent N20 peak and of different cut-off points for the N70 peak in predicting bad outcome are shown in the Table 1.

TABLE 1

	Specificity	Sensitivity	PPV	NPV
N20 absent	1	0.40	1	0.33
N70 cut-off 148 ms	0.98	0.70	0.97	0.69
N70 cut-off 127 ms	0.77	0.84	0.79	0.83
N70 cut-off 110 ms	0.33	0.97	0.35	0.96

CONCLUSIONS. Recording of SEP N20 peak predicted correct outcome only in 29% of cardiac arrest survivors. Additional recording of the N70 peak increased the predictive accuracy of SEP. A N70 peak >148 ms or absent predicted bad outcome with a specificity of 98%, whereas a N70 peak <110 ms predicted favourable outcome with a sensitivity of 97%.

0543

BARRIERS TO RESEARCH TRANSLATION. A QUALITATIVE STUDY INTO THE INTRODUCTION OF THERAPEUTIC HYPOTHERMIA FOR POST RESUSCITATION CARE IN A DISTRICT GENERAL HOSPITAL

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INTRODUCTION. The International Liaison Committee on Resuscitation (ILCOR) has recommended the use of therapeutic hypothermia (TH) after cardiac arrest since 2002. Evidence for the use of TH in patients with a return of spontaneous circulation after cardiac arrest is based on two prospective randomised control trials and one meta-analysis [1−3]. The uptake of TH has been variable [4]. ILCOR has called for research into the barriers to an effective approach the implementation of TH [5, 6].

OBJECTIVE. To identify the barriers to the implementation of the uptake of TH for post-resuscitation care of cardiac arrest patients.

METHODS. Semi-structured qualitative interviews of 16 doctors, nurses and managers in all departments with a stake in post resuscitation care in a 500 bedded acute general hospital in the UK. Purposeful sampling was used and interviews continued until data saturation was achieved. Transcripts of interviews were analysed in themes based on the principles of grounded theory.

RESULTS. Whilst some participants were highly motivated, many clinicians expected the outcome of patients in this group to be poor. The overwhelming attitude was not conducive to change. The decision making surrounding treatment decisions for these patients was perceived to be influenced by capacity in ICU, relatives' wishes and different consultants attitudes. The inter-departmental working patterns could be improved by greater transparency over decisions. The evidence for TH was challenged and the logistics perceived to be too great. There was no consensus from the ICU and the organisational structure could be improved.

CONCLUSION. Barriers to the implementation of TH are clearly linked to the management of post-cardiac arrest patients. Areas for improvement have been highlighted including the need for better communication between the teams and a more efficient organisational structure to facilitate better patient care.

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0544

ICPR: NEW SOFTWARE FOR CARDIOPULMONARY RESUSCITATION TRAINING

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PURPOSE OF THE STUDY. The consolidated importance of cardiopulmonary resuscitation (CPR) for survival of cardiac arrest patients has been integrated with the role of good-quality CPR to significantly improve outcome. When tested on mannequins, CPR quality performed by lay rescuers and health care professionals tends to deteriorate significantly within a few months after training. iCPR is a software for iPod and iPhone downloadable from Apple Store built specifically to help CPR retention and ameliorate feedback about quality CPR training.

MATERIALS AND METHODS. We built a software specifically dedicated to self-directed CPR training through a tutorial including a simple feedback module dedicated to guide training in relation to the quality of CPR. The software can be used with iPod and iPhone on armbands commonly used for running. The accelerometer mounted inside iPod and iPhone measures the rate and the depth of compressions and gives audio-visual feedback to the operator of performance to reach the guideline target (100 compressions per minute and 4–5 cm depth). The tutorial is based on ILCOR (AHA and ERC guidelines) and periodically can be used to easily refresh the CPR algorithm through a slideshow inside iPod and iPhone.

RESULTS PRESENTED IN SUFFICIENT DETAIL TO SUPPORT THE CONCLUSION. Our preliminary tests on iCPR were performed on a group of 50 healthcare professionals to validate the comfort, the user-friendliness and the accelerometer precision compared to other quality CPR devices.

CONCLUSIONS. iCPR can become a easy and cheap software to help rescuers maintain retention of CPR skills.

0545

COMPARISON OF EXTERNAL JUGULAR CANNULATION WITH MORE PERIPHERAL VEINS AS AN ACCESS ROUTE IN CARDIAC ARREST SITUATION

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INTRODUCTION. Even under best of circumstances obtaining peripheral venous access is challenging and time consuming in cardiac arrest situation. Significant delay in delivery of drugs to the heart is seen when peripheral access is used. Thus better route will be a peripheral vein, large in size, easy to cannulate and offering quick access to central circulation. External jugular vein (EJV) has all these attributes.

OBJECTIVES. To determine the success rates with EJV versus more peripheral veins in out of ICU cardiac arrest scenarios.

METHODS. All patients developing cardiac arrest out of ICU, during the period from June 2006 to December 2008, were randomized to have peripheral or EJV cannulation. Data were collected regarding time required for cannulation, number of attempts and failure rates, with time required for cannulation being the primary outcome measure.

RESULTS. A total of 82 patients were included in the study with 40 (48.8%) receiving peripheral cannula and 42 (51.2%) receiving EJV cannula. 15/40 and 30/42 veins could be cannulated in less than one minute in peripheral and EJV groups, respectively ($p = 0.01$). Mean time to cannulate EJV was 66 seconds versus 133 seconds for more peripheral vein cannulations ($p = 0.002$). Overall, 21/40 and 35/42 cannulations could be achieved in first attempt in peripheral and EJV groups, respectively ($p = 0.028$). In three patients, peripheral vein could not be cannulated and hence EJV or a central vein was cannulated. In the EJV group, all patients had successful cannulations (Table 1).

TABLE 1 COMPARISON BETWEEN EJV AND PERIPHERAL VEINS

Parameter of interest	Peripheral venous cannulation ($n = 40$)	EJV cannulation ($n = 42$)	P value
Time taken			
<1 min	15 (37.5%)	30 (71.4%)	0.01
1–5 min	19 (47.5%)	12 (28.6%)	
>5 min	3 (7.5%)	0	
Mean time taken (s)	133.1 + 122.7	66.1 + 47.8	0.002
No. of attempts			
1	21 (52.5%)	35 (83.3%)	0.028
2	9 (22.5%)	5 (11.9%)	
3 or more	7 (17.5%)	2 (4.8%)	
Failure rates	3 (7.5%)	0	

CONCLUSIONS. EJV in comparison to more peripheral veins takes significantly lesser time to cannulate in cardiac arrest victims with lesser number of attempts required and lesser failure rates. Thus it is an easy, faster and reliable venous access route in cardiac arrest scenarios.

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GRANTS. None.

0546

COMPARISON OF IN HOSPITAL CARDIAC ARRESTS IN TWO CONSECUTIVE PERIODS

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OBJECTIVES. To determine the evolution of the survival and main characteristics of the cardiac arrests in a hospital when comparing two consecutive periods.

METHODS. A prospective cohort study of all the resuscitation attempts occurred in the general center in the university hospital "Virgen de las Nieves" (Granada, Spain). Used in-hospital Utstein style, collecting only the first episode per patient. We excluded resuscitation efforts made during surgical interventions and any other not attended by the hospital resuscitation team. Too excluded those resuscitation when efforts initiated prior to emergency room. We compared data from two consecutive period: July/2003–December/2005 and January/2006–December/2008. We analyzed survival to hospital discharge and the main characteristics of the patients in both periods. Results were expressed as means, medians, and both series were compared using the Yates' test when the dependent variable was qualitative and the *t* Student for independent samples for quantitative.

RESULTS. We collected in the first period a total of 203 arrest (6.76 arrest/month) and 260 in the second (7.2 arrest/month). The median age of patients was also similar in both groups: 63.1 ± 14 years versus 64.8 ± 12.7 years (ns) as well as by gender (males 60 and 59%, respectively, in first and second series). There was a significant decrease in the proportion of arrest of cardiac origin in the first period (62%) over the second (49%) (19.6, $p < 0.001$) but not in the proportion of shockable rhythm (ns). The proportion of cardiac arrests occurred in the intensive care unit compared to the total (48.7% vs. 42.3%) presented no statistical differences. The hospital survival in both series (23.1% and 23.2%) were similar (ns).

CONCLUSIONS. There have been no improvements in survival between the two periods examined in our hospital and patient characteristics remained similar, except for a decrease in cardiogenic etiology.

0547

A RANDOMIZED CONTROLLED TRIAL OF PHARYNGEAL COOLING SYSTEM DURING CARDIOPULMONARY RESUSCITATION

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INTRODUCTION. The development of a technique that enables brain temperature to be immediately and selectively reduced without affecting systemic circulation is needed to perform resuscitative hypothermia in a clinical situation. Since bilateral common carotid arteries exist at 1 cm from the pharynx, cooling the pharyngeal region decreases the carotid arterial temperature first and subsequently decreases brain temperature before lowering cardiac temperature. A multi-center (12 of emergency critical care centers in Japan) prospectively randomized controlled trial of pharyngeal cooling system during cardiopulmonary resuscitation will start in June 2009.

PURPOSE. This study will be performed to elucidate the effects of pharyngeal cooling initiated during resuscitation on tympanic temperature, neurological recovery and mortality rate

Pharyngeal cooling cuff

Pharyngeal cooling cuff

INCLUSION CRITERIA.

1. Patients (16–89 years) with witnessed cardiogenic cardiac arrest or witnessed non-cardiogenic cardiac arrest except posttraumatic cardiac arrest.
2. Patients who have been resuscitated by medical services within 15 min after the onset of cardiac arrest.

TREATMENTS. Patients in the treatment group will undergo pharyngeal cooling during resuscitation or within 30 min after the onset of spontaneous circulation. After tracheal intubation, pharyngeal cooling cuff is inserted into the pharynx. Physiological saline (5°C) circulates into the pharyngeal cooling cuff at the rate of 500 ml/min for 2 h. Intra cuff pressure is controlled at 50 cmH_2O.

PRIMARY ENDPOINT AND POWER ANALYSIS. Lowering tympanic temperature greater than 1 degree centigrade.According to the power analysis, 300 cases will be needed.

SECONDARY ENDPOINTS

1. Glasgow Coma Scale at 2 weeks after resuscitation.
2. Glasgow Pittsburgh cerebral performance and overall performance categories at 1 month and 6 months after resuscitation.
3. Mortality rates at 1 month, 3 months and 6 months after resuscitation.

0548

ANALYSIS AND LONG-TERM MONITORING OF IN-HOSPITAL CARDIOPULMONARY RESUSCITATION

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OBJECTIVES. To establish the main features, results and long-term evolution (5 years) of patients who suffered a cardiac arrest according to the in-hospital Utstein style.

METHODS. Prospective study of all cardiac arrests occurred in a university hospital during a period of 2.5 years (Julio/2000–Diciembre/2002) according to the Utstein style. Exclusion criteria were the PCR occurring in the operating rooms, not attended by the hospital resuscitation team and those when life support maneuvers were initiated before hospital admission. Subsequently conducted a follow-up of all survivors identified until 5 years. We collected all the key variables considered in the Utstein style. To assess the patient's controls were used in these scales of brain function categories Glasgow–Pittsburgh (CPC) for neurological function and level of overall function of Glasgow–Pittsburgh (OPC) for the overall situation. The deceased were collected the interval too.

RESULTS. A total of 203 patients were treated by cardiac arrest during the period of which 47 survived (hospital survival 23.15%) and were included in the follow-up. The 60.6% were male and mean age 63.2 (±14.92) years. The most common location was the ICU (48%) and 62% there was a cardiac origin. The first shockable rhythm was detected in 62 patients. The initial rate of successful resuscitation (ROSC > 24 h) was 17.3%. The vast majority of them were discharged in excellent neurological and general functional status (75% in the optimum). After 5 years of follow-up of these patients, 31 were still alive (69.9% hospital survivors and 15.3% of all the patients cared for by cardiac arrest in hospital) and 2 could not be located. The distribution of deaths was heterogeneous along the track with a backlog of cases in the first few months. All patients except one were contacted in the best position both neurological (CPC 1) and general (OPC 1). We found a statistically significant association between the degree CPC/OPC 1 when the hospital discharge and the probability of being alive at 5 years later (Fisher test 5.65, $P = 0.029$).
CONCLUSIONS. Patients surviving a cardiac arrest in hospital remain alive and most of them in good neurological and functional status. The good functional status at discharge is associated with long-term survival.

0549

PREDICTIVE VALUE OF NEUROLOGICAL EXAMINATION FOR RESULTS OF SOMATOSENSORY EVOKED POTENTIALS IN PATIENTS AFTER CARDIAC ARREST

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INTRODUCTION. To determine the prognosis of postanoxic coma after cardiopulmonary resuscitation (CPR), somatosensory evoked potentials (SSEP) of the nervus medianus can be used [1]. Bilateral absence of the cortical responses (N20) of this SSEP invariably correlates with a poor neurological outcome. However, bilateral presence of the N20 responses does not predict awakening. Patients are examined neurologically before a SSEP is requested. The results of this examination might lead to the decision not to perform a SSEP, as the cortical responses are expected to present.

OBJECTIVES. Aim of this study was to determine the characteristics of neurological examination, always yielding a positive SSEP.

METHODS. Data from the PROPAC study [2], in which patients who remained in coma 24 h after CPR were included, were used. Neurological examination, consisting of Glasgow Coma Score (GCS) and brainstem reflexes, and SSEP were performed 24, 48 and 72 h after admission. The neurological examination (pupillary reaction, corneal reflexes, eye and motor scores) and SSEP (positive when N20 bilaterally present) were correlated with a 2×2 table to determine sensitivity, specificity and positive (PPV) and negative predictive values (NPV).

RESULTS. Data of 407 patients were included, 67% male, mean age 63 (range 18–92). 764 SSEPs were performed in this group, 471 were positive. No correlation predicting SSEP results was found for pupillary reaction, corneal reflexes and GCS eye scores. Only motor score of 5 or 6 (localizes painful stimuli or obeys to commands) predicted a positive SSEP: specificity 1.0 (95% CI 0.98–0.99) and a PPV of 0.9 (95% CI 0.8–1.0).

CONCLUSION. This study shows that the cortical N20 responses of median nerve SSEP are always present in patients who localize painful stimuli or obey to commands. Lower motor scores and brainstem reflexes do not predict SSEP results and therefore cannot be used to decide whether or not to do this test. Surprisingly, other items investigated with clinical neurological examination did not predict SSEP results reliably. The PROPAC study was performed before treatment with therapeutic hypothermia was routinely used. This might limit the usefulness of the results found, as neurological examination is hampered by sedative medication administered during hypothermia. Another limitation is that neurological examination in the PROPAC study was also performed by other physicians than neurologists.

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0550

IDENTIFICATION OF THE ETIOLOGY OF 314 SERIAL NON-CARDIAC CARDIOPULMONARY ARREST USING US AND/OR US

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INTRODUCTION. Most of out-of-hospital cardiopulmonary arrest (OH-CPA) patients are thought to be cardiac origin in the world, and most of them are thought to show VF as an initial cardiac rhythm. However, the term "cardiac origin" is defined as CPA derived from clear cardiac disease such as acute myocardial infarction or exception from clear non-cardiac origin. It is defined as following in Utstein template; "an arrest is presumed to be of cardiac etiology unless it is known or likely to have been caused by trauma, submersion, drug overdose, asphyxia, exsanguination, or any other noncardiac cause as best determined by rescuers." However, we can only guess the etiology of OH-CPA using very restricted methods during advanced resuscitation in the hospital. The accurate etiology of OHCA is not clear and well established even today. In this study, we evaluate the etiology of OHCA of population based data using US and/or CT.

METHODS. We treated serial 849 OH-CPA patients in our emergency department for the past 2 years. OH-CPAs occurred after contact of EMS and occurred in the hospital are excluded. We examined the etiology of these patients during resuscitation using blood examination including blood sugar, troponine and CK, arterial blood gas analysis, plane chest x-ray, US and CT. We reviewed medical records of these patients and evaluate the etiology of cardiac events from performed examinations and patients' history. If we could found lethal and clear etiology easily by their history such as trauma, neck hanging, terminal stage of malignancy, or distinct airway obstruction, we diagnosed the etiology of CPA without any other special examinations. In other cases we performed CT, US, and/or trans-esophageal US.

RESULTS. In all 849 patients, 102 were due to trauma and 49 were neck hanging, whom we did not perform any special examination to determine their etiology. In other 698 patients, we perform brain CT in 293 patients and body CT in 58 patients, and chest and abdominal US in all patients. We determine etiology of the 314 patients as non-cardiac origin including trauma and neck hanging, in which 52 (17%) were great vascular disease origin, 7 (2%) pulmonary embolism, 39 (12%) cerebrovascular disease, 19 (6%) renal failure, 12 (4%) gastrointestinal disease, 67 (21%) airway obstruction by malswallowing, 24 (8%) hypoxia due to pneumonia, 20 (6%) worsening of COPD, 7 (2%) attack of asthma, 74 (24%) submersion in bath tab.

CONCLUSIONS. The population of OH-CPA from cardiac origin is not so high (63%). The population of OH-CPA from cardiac origin is probably decreasing according to aggressive examinations such as US and CT. The etiology of OH-CPA of non-cardiac origin is thought to be various and different among countries.

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0551

PRONE POSITION IN BRAIN INJURED PATIENTS WITH ACUTE RESPIRATORY FAILURE

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INTRODUCTION. Prone position (PP) may improve gas exchange in severe acute respiratory failure (ARF). Its potential deleterious effect on ICP precludes its use in brain injured patients (BIP). We present four cases of BIP with severe ARF who were placed in PP for lowering FiO_2 to $\leq$0.6, providing ICP $\leq$ 20 and CPP $\geq$ 65. In case 4 $PTiO_2$ was monitored.

CASE 1: 17-year-old ♂. Severe TBI. Epidural haematoma and hemorrhagic petechia in lamina quadrigemina. On 6th day, he shows ARF. Diagnosis of ventilator-associated pneumonia (VAP) was made. On 9th day he was placed in PP for 16 h. The patient made a good recovery. Upon discharge from ICU, he was awake and showed left brachial weakness that eventually disappeared (Table 1)

TABLE 1 CASE 1

	Before PP	PP	After Manitol	12 h in PP	After Manitol	16 h in PP	SP
ICP	15	28	20	30	17	19	13
MAP	82	94	89	93	92	104	106
CPP	67	66	69	63	75	85	93
PaO_2	60	92	92	93.7	93.7	91.2	89
FiO_2/PEEP	1/10	0.8/10	0.8/10	0.7/9	0.7/9	0.6/8	0.6/8
PaO_2/FiO_2	60	115	115	133.8	133.8	152	148.3

CASE 2. 69-year-old ♂. Moderate TBI. Initial high ICP responsive to sedation, analgesia, muscle relaxation. On 9th day he shows VAP and severe ARF. On day 10th PP was tried for 6 h. A favourable course was observed. He was discharged from ICU awake and with tracheotomy. On discharge from hospital, normal neurological examination (Table 2)

TABLE 2 CASE 2

	Before PP	PP	After Manitol	3 h in PP	6 h in PP	SP
ICP	19	25	17	18	19	16
MAP	84	87	83	83	84	82
CPP	65	62	66	65	65	66
PaO_2	66	66	72	97	96	97.6
FiO_2/PEEP	1/14	1/14	0.8/14	0.7/14	0.6/13	0.6/13
PaO_2/FiO_2	66	66	90	138.5	160	162.66

CASE 3. 36-year-old ♂. Intracerebral hemorrhage opened to ventricles. Surgical treatment was ruled out. High ICP was pharmacologically controlled. On 3rd day, ARF ensues from neurogenic pulmonary edema. PP was adopted for 12 h. A rapid improvement was obtained. Clinical course was favorable. On discharge from ICU: awake and with mild left weakness (Table 3)

TABLE 3 CASE 3 AND 4

	Before PP		PP		After Manitol	12 h in PP		SP	
	Case 3	*Case 4*	Case 3	*Case 4*	Case 3	Case 3	*Case 4*	Case 3	*Case 4*
ICP	18	*20*	16	*22*	16	14	18	14	13
MAP	85	*85*	88	*93*	92	92	100	85	90
CPP	70	*65*	72	71	66	78	82	71	75
PaO_2	57	*63.9*	92	195	143	118	177	159	85
FiO_2/PEEP	1/10	*1/15*	1/10	1/16	0.5/15	0.4/9	0.5/12	0.4/9	0.5/14
PaO_2/FiO_2	87	*63.9*	92	195	286	295	354	397.5	170
$PTiO_2$		*8*		13	24.4		22.2		16

CASE 4. 40-year-old ♂. Intracerebral haemorrhage due to aneurysmal rupture. Urgent surgery (evacuation, decompressive craniectomy, blood transfusion). On day 3rd ARF was observed, related to ARDS. PP was tried for 24 h. Slow favorable recovery (tab 03). No need for tracheotomy. On discharge from ICU: awake, aphasic, right paresia.

CONCLUSIONS. No conclusions for general practice**.** PP could be CAUTIOUSLY CONSIDERED as an option for BIP with severe ARF.

0552

ALTERATION OF CARDIOPULMONARY FUNCTION AFTER SEVERE HEAD INJURY

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INTRODUCTION. It is very hard to achieve optimal water balance in severe head injury (SHI) patient (GCS $\leqq$ 8). Cardiopulmonary complications are common after SHI: neurogenic pulmonary edema, cardiac failure, and so on. In this study we will present the alteration of cardiopulmonary function on PiCCO plus monitoring after SHI.

METHODS. Plasma catecholamines, natriuretic polypeptides, thrombomodulin and D-dimer of nine patients were measured immediately after SHI. The cardiopulmonary functions of nine consecutive patients were monitored by PiCCO plus daily during a week after SHI.

RESULTS. Noradrenalin (NOR), dopamine (DOA) and BNP concentrations were significantly high during the entire study period. Significantly, higher elevations of plasma thrombomodulin and D-dimer concentrations were also observed after SHI. Intrathoracic blood volume was maintained in spite of systemic hypovolemia, and this fluid redistribution caused hydrostatic fluid retention in lung tissues on PiCCO plus monitoring after SHI.

CONCLUSIONS. Persistent catecholamine release and the different sensitivity of blood vessels to catecholamine cause the blood volume redistribution: systemic hypovolemia and hydrostatic pulmonary edema. The excess cardiac preload due to catecholamine release leads to BNP release resulting in natriuresis.

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0553

FUNCTION SKILL IMPACT AFTER DECOMPRESSIVE CRANIECTOMY AS A SECOND LEVEL THERAPY IN PATIENTS SUFFERING INTRACRANIAL HYPERTENSION

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INTRODUCTION. The aim of this study is to report the function skill impact after decompressive craniectomy (DC) included as a therapy in the control of intracranial hypertension (IH) in patients admitted to an Intensive Care Unit (ICU) in a tertiary reference hospital, with the help of the Glasgow Outcome Scale (GOS) and the Barthel Index (BI) at discharge and the changes after 6 and 12 months.

METHODOLOGY. We recorded all adult patients (18 years old or more) data, admitted to our ICU in the interval time period going from 01/01/2007 up to 31/12/2008, who underwent a DC due to uncontrolled high intracranial pressure (ICP) after medical therapy failure. Epidemiologic data, cause leading to DC, Glasgow Coma Scale (GCS) at admission, GCS before and immediately after DC, previous and post DC computer tomography (CT) reports, ICP monitoring prior to and after DC, from admission to DC surgery time interval, destination on discharge, and GCS, GOS and BI on discharge from hospital were registered.

RESULTS. From a total of 165 patients admitted to ICU with high ICP, we reported 10 patients (70% men, 30% women) with refractory high ICP. In seven patients raised ICP was secondary to traumatic brain injury; rupture of a cerebral aneurysm was the cause in two patients and in one patient a malignant middle cerebral artery (MCA) infarction was present. Mean GCS at admission was 7. Stage II diffuse axonal injury (DAI) was the most frequently CT report (6 patients) while stage III DAI was present in 2 patients and stage I DAI in one patient. Surgical injury was appreciated in one patient. After DC surgery the CT reports found stage III DAI (5 patients), stage II DAI (2 patients), surgical injury (2 patients) and malignant MCA infarction (1 patient). Mean first ICP measurement was 21 while just before DC became 33. The mean time to accomplish DC surgery was 79 h, and ICP mean measurement just after DC was 20. Fronto-temporal-parietal DC was conducted in eight patients while Frontal bilateral craniotomy approach was done in two patients. Mean ICU length of stay was 22 days. Two patients died. Severe disability (GOS 3) was present in five patients, persistent vegetative state (GOS 2) in three patients, and death (GOS 1) in two patients. Six months later, severe disability (GOS 3) appeared in two patients, moderate disability (GOS 4) in three patients, there were three deaths (GOS 1) and good outcome (GOS 5) was present in one patient. Mean Barthel Index at discharge was 21, rising to 46 after 6 months and up to 51 in 12 months.

CONCLUSION. In our short experience, we feel DC is a useful technique, especially if done early after brain injury, for refractory ICP control in patients with IH. This may improve functional outcome in these patients. Prospective and multicenter studies are and have to be carried out.

BIBLIOGRAPHY. Study RescueICP.

0554

HIGH PLATELET COUNT MAY CORRELATE WITH POOR NEUROLOGICAL OUTCOME AFTER MODERATE TO SEVERE TBI

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INTRODUCTION. The pathophysiological mechanisms of traumatic brain injury (TBI) are complex and known to involve both hemodynamics and metabolism [1].

OBJECTIVES. To find out if there is any correlation between high platelet counts and poor early neurologic outcome (within 30 days) in patients with moderate to severe TBI.

METHODS. Retrospective observational study on 50 patients admitted with isolated moderate to severe TBI who survived for more than 1 month after injury. Patients who died before completing 1 month, who required multiple resuscitative transfusions, who had sepsis induced thrombocytopenia or heparin induced thrombocytopenia (HIT), and those who received antiplatelet agents prior to or after injury were excluded from the study. All patients were treated according to brain trauma foundation guidelines. Determination of consciousness was based on Glasgow coma score (GCS) that had been recorded on Day 1, 8, 15, 22, and 30. Platelet counts were also recorded in the same days. Patients were classified according to GCS into three groups. Group 1 had GCS of $\geq$9, Group 2 had GCS of 7–8, and Group 3 had GCS of $\leq$6. Patients were allowed to swap between groups if there GCS showed improvement or deterioration.

RESULTS. Thirty sex male and 14 females were included in the study with a mean age of 29 years ($\pm$24). Thirteen out of 50 were involved in road traffic accidents, 23 had direct trauma to the head, and 14 had falls from height. Seven out of them had extradural or subdural hematoma, 10 had brain edema, and 19 had brain contusions, and diffuse axonal injury (DAI). The platelet counts did not show any statistically significant differences between the three groups on admission and on day 8. Although it was statistically insignificant, patients in group 3 had a trend of high platelet counts compared with group 1 on days 15 and 22 (P 0.092 and 0.051, respectively). On day 30, patients in group 3 had a significantly higher platelet counts compared to group 1 (P 0.003). Moreover, patients in group 2 had less significant higher platelet counts compared to group 1 (P 0.02).

CONCLUSIONS. We concluded that higher platelet counts in patients with moderate to severe TBI strongly correlate with early poor neurologic outcome. The exact cause and mechanism of this pathophysiologic pattern is not yet clear and still need more research to define it properly.

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KEY WORDS. Traumatic brain injury, high platelets.

0555

GUILLAIN-BARRE SYNDROM:PROGNOSIS AND RISK FACTOR DIFFERENCES BETWEEN CHILDREN AND ADULTS IN INTENSIVE CARE UNIT

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INTRODUCTION. One-third of patients with Guillain-Barré syndrome (GBS) require admission to the intensive care unit (ICU) associated significant risk of morbidity, mortality and incomplete recovery [1]. A many studies describe the outcome of GBS is more favorable in children than in adults [2].This study this is meant to analyse risks factors that children/adults.

METHODS. Retrospective study from January 1999–December 2008. Analysis of all patients admitted in ICU for confirmed GBS (clinic, electromyography and lumbar) and subject to intra venous immunoglobulin with or without plasmapheresis exchange.

We compared the events and outcomes both two subgroups (children and adults)

RESULTS. During 10 years, 94 patients [22(23.4%) children and 72(76.6) adults] were admitted in our ICU. The average age of children was 8 years (range 2–15) that of adult was 41 years (range 16–75).

80% of children were admitted during precocity deficit ascending phase 20% during plateau phase. Where as 88% of adults were admitted during plateau phase. 5 patients (1 child and 4 adults) were admitted after cardiac arrest.

8 (36) of children and 54 (75%) of adults requiring artificial ventilation. Hospitalisation period in the icu was 10 days (range 4–28) for children versus 17 days (range 6–80)

We recorded 3 (13.6) children versus 18 (25%) adults death: 1 child and 14 adults presented autonomic disturbances before the death. 2 children and 2 adults developed a fatal acute respiratory distress syndrome. Septic shock caused the death of 2 adults.

The association GBS and acquired critically neuromyopathy were the causes of weaning and long ICU bed-stay for 12 adults.

CONCLUSION. Late diagnosis GBS and late hospitalisation in the ICU, autonomic disturbances, immunosuppression and association acquired critically neuromuscular are death factors more present with adults then with children.

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0556

MONITORING OF CEREBROVASCULAR PRESSURE REACTIVITY (PRX) IN NEUROSURGICAL PATIENTS

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INTRODUCTION. Cerebrovascular pressure reactivity is the ability of cerebral vessels to respond to transmural pressure changes. Cerebrovacular pressure reactivity index (PRx) is determined as the moving correlation coefficient of mean intracranial pressure (ICP) and mean arterial blood pressure (MAP).

METHODS. We present data of 40 critical patients harboring severe brain trauma or spontaneous intracranial hemorrhage, who underwent monitoring of cerebrovascular pressure reactivity. All patients were monitored for brain tissue oxygenation ($PtiO_2$–LICOX), while five patients also underwent regional cerebral blood flow (CBF) monitoring with a thermodiffusion probe (Hemedex). Patient outcome was assessed with modified Glasgow Outcome Scale (GOS). We compared the results of PRx monitoring with the $PtiO_2$ and CBF monitoring.

RESULTS. There was a correlation of PRx with PtO_2 and CBF monitoring. Cerebrovascular pressure reactivity index seems to correlate positively with patient outcome. In addition to that it is a sufficient index of successful treatment as it shows improvement when patient's management is adequate.

CONCLUSIONS. PRx is a secondary index derived from ICP and MAP changes. It can be used complementary for the assessment of brain damage severity as well as successful treatment management, but there is still time needed to evaluate the best use of it in neurosurgery.

0557

BRAIN TISSUE OXYGENATION PRESSURE ($PTIO_2$) MONITORING IN HEAD INJURED PATIENTS: USEFULNESS FOR OPTIMIZING MEAN ARTERIAL PRESSURE AND CEREBRAL PERFUSION PRESSURE

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INTRODUCTION AND OBJECTIVES. Low arterial pressure and low cerebral perfusion pressure in head injury are frequently associated to cerebral ischemia. In head injured adults, it is recommended to maintain cerebral perfusion pressure (CPP) higher than 60 mmHg to assure cerebral perfusion. The main objective of this research was to establish if the continuous monitoring of tissular cerebral oxygen pressure ($ptiO_2$) is useful for the identification of the lower mean arterial pressure and CPP associated to a normal and stable cerebral blood flow and consequently a normal oxygen delivery.

METHODS. In 29 severe head injured patients (GCS at admission <9; mean age 35.5 years) the continuous recording of Intracranial Pressure (ICP), $ptiO_2$ (brain tissue oxygen pressure) and Mean Arterial Pressure (MAP) during the 72 first hours was analyzed. Patients with Diffuse Injury (traumatic Coma Data Bank) type II (41%) and III (34%) were the more frequent in this series. Cerebral hypoxia episodes (defined as $ptiO_2$ lower than 20 mmHg) were classified according Siggaard–Andersen classification. The diagnosis of Ischemic Cerebral Hypoxia due to absolute/relative Hypotension was established when: a decrease of MAP was associated to a parallel decrease of $ptiO_2$ (non attributable to primary increase of ICP or low extractivity cerebral hypoxia) with return to normal values after increasing MAP. The incidence of ischemic cerebral hypoxia due to hypotension was analyzed in the whole group. The efficacy of maintaining a CPP over 60 mmHg that assured a normal $ptiO_2$ was also evaluated.

RESULTS. Cerebral hypoxia episodes of several mechanisms was observed in 23 patients (79.3% of the whole group). Ischemic Cerebral Hypoxia due to Hypotension was present in 19 patients (65.5%). In this subgroup, 18 patients suffered more than 1 these episodes and 3 more than 3 episodes. In 10 patients Ischemic Cerebral Hypoxia due to absolute/relative Hypotension was detected even maintaining a CPP over 60 mmHg. In this group the average lower value of CPP for maintaining $ptiO_2$ normal was 73 mmHg. In two episodes a value of CPP higher 80 mmHg was needed to $ptiO_2$ over 20 mmHg.

CONCLUSIONS. In head injured patients, continuous monitoring of brain $ptiO_2$ can frequently detect cerebral hypoxia episodes no due to increase of ICP. Systemic hypotension is often related with brain hypoxia episodes. The maintenance of CPP over 60 mmHg does not assure a normal oxygenation of the brain. The simultaneous monitoring of ICP, CPP and $ptiO_2$ is useful for detection and treatment of cerebral hypoxia due to systemic hypotension.

0558

AN AUDIT OF FINDINGS ON CT SCANS OF THE BRAIN PERFORMED CRITICAL CARE IS "NOT WAKING UP" A VALID INDICATION?

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BACKGROUND. Transferring ventilated patients from critical care to CT scan entails risk, from transfer [1] and arguably from radiation dosing. In our practice we often request CT scans of the brain to exclude intracranial pathology if a patients' neurological recovery is slow or absent after stopping sedation.

SETTING. A 19 bed Critical Care Unit in a University Hospital where the Picture Archiving and Communication System (PACS) was installed in late 2006.

AIMS. Our aim was to assess the value of CT brain scans on patients with slow or absent neurological recovery from critical illness (excluding brain injury). By analysing the indications for all CT Brain scans and the rate of positive findings we aimed to draw conclusions regarding validity of requests looking for intracranial pathology when a patient was not waking up as might be expected, or their Glasgow Coma Score (GCS) remained unexpectedly low.

METHODS. Using PACS we identified all CT scans performed from 1/1/2007 to 31/3/2009. Reports for all brain scans were analysed; each showed reasons for requesting the scan, and the radiologists' final report.

The reason for requesting each scan was categorised, and the result classified as positive or negative. A positive result was one which showed definite intracranial pathology, or significant new changes since a previous scan.

The following were excluded from the main analysis: scans taken at admission or first scans at <24 h, scans after neurosurgery or as routine follow up for known traumatic brain injury (TBI), and those indicated by focal neurological signs, an acute fall in GCS, or raised Intracranial pressure (ICP) on an invasive monitor.

Paper records were checked when electronic data was incomplete.

Focal neurology was defined as: Unexplained change in pupil reactivity, reduced limb/facial muscle movements, dysphasia, aphasia, or decerebrate/decorticate posturing.

RESULTS. A total of scans 250 CT brain scans were identified; 140 were post-admission, of which 52 were carried out purely for failure to wake appropriately.

- One (1.9%) of these 52 showed a new finding.
- 10 out of 14 (71%) scans requested for follow-up after neurosurgical intervention were positive.
- 8 out of 15 (53%) post-admission scans requested for focal neurological signs were positive.
- 4 out of 10 (40%) scans requested for raised ICP were positive.

CONCLUSIONS. CT brain performed for reasons of failure to wake appropriately, in the absence of focal neurology, known TBI, raised ICP or recent neurosurgery had a sensitivity of 1.9%. We suggest this indication should not be used in routine practice.

DISCUSSION. This audit did not attempt to identify whether a negative result from a CT brain affected patient management. Preliminary analysis while planning this audit suggested this would require prospective study. This may require >2 years to complete.

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0559

EFFECT OF DIFFERENT FLUID RESUSCITATION ON BRAIN TISSUE OXYGEN DEPTH IN PATIENTS WITH SEVERE TRAUMATIC BRAIN INJURY

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INTRODUCTION. Severe head injury is associated with high morbidity and mortality due to secondary brain injury. Invasively measured parameters are used in the therapeutic algorithm as a guide to reduce the ischemic complications. The LICOX microelectrode is able to measure the parenchymal brain tissue oxygen depth ($P_{br}O_2$) and brain temperature (T_{br}).

OBJECTIVES. We investigated the change in invasively measured parameters (SBP, DBP, MAP, ICP, CPP, $P_{br}O_2$, T_{br}) following different fluid management.

METHODS. Patients with GCS $\leq$ 8 were recruited for this study who were fully and invasively monitored within 12 h after hospital admission and were treated with a standard therapy. If CPP $\leq$ 65 mmHg and/or $P_{br}O_2 \leq$ 15 mmHg, all patients were treated with either cristalloid (Salsol) or colloid (Voluven) infusion. Glasgow Outcome Scale (GOS) at discharge from hospital or death were used as measures of clinical outcome. Statistics: Student t test [2], Spearman correlation and Mann–Whitney U test were used.

RESULTS. A total of 15 patients were examined. Eight patients with poor outcome (GOS $\leq$ 2) had a significantly higher first measured ICP (median: 15.5, IQR: 8.5–30.5 vs. 6, 1–8.5, $p = 0.037$). In the first 24 h, $P_{br}O_2$ was above 15 mmHg in 8 patients, in whom T_{br} was significantly higher (mean: 37.6, 95% CI: 37.1–38.0 vs. 35.7, 34.5–37.0, $p = 0.015$). Volume resuscitation with colloid infusion resulted in significant improvement in hemodynamic parameters (SBP, MAP, CPP) and reduced ICP. In patients treated with only crystalloids, no significant changes were observed. There was no difference in mortality between the groups, but there were significant differences not only in hemodynamics but also in brain tissue oxygen tension, favoring the colloid treated group.

CONCLUSIONS. The higher ICP in the early stage predicts a higher mortality and worsens the secondary hyperthermic brain injury. Voluven infusions have beneficial effects on both systemic and cerebral circulation indicating improvement in cerebral perfusion pressure and brain tissue oxygen depth.

0560

EFFECTS OF VOLUME THERAPY ON CEREBRAL OXYGENATION AND METABOLISM

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INTRODUCTION. Hypovolemia treatment of is one of the main goals of intensive care of neurosurgical patients. But effects of hypovolemia and volume therapy on cerebral oxygenation and metabolism are still unknown. The purpose of our study was to investigate the dynamics of brain oxygen tension ($PbrO_2$) and cerebral metabolism during hypovolemia correction in patients with intracranial hemorrhage.

METHODS. We analyzed 41 episodes of hypovolemia correction with HES 130/0.4/9:1 in 8 patients with intracranial hemorrhage and GCS 4–8 (3 with aneurismal SAH, 5 with severe TBI). Monitoring of systemic hemodynamics and cerebral microdialysis was used in all patients. $PbrO_2$ was investigated in 4 patients. Microdialysis and $PbrO_2$ catheters were placed into "lesioned" and "intact" brain tissue. Decrease of global end-diastolic volume index (GEDVI) below 680 ml/m^2 was the indication for HES infusion. The average amount of infused HES was 500 ml (6–8 ml/kg of body weight).

RESULTS. FiO_2, Hb, PaO_2, $PaCO_2$, PaO_2/FiO_2, blood temperature and serum glucose concentration were stable during the study. GEDVI, cardiac index (CI) and cerebral perfusion pressure (CPP) significantly improved after HES administration [before infusion: GEDVI 604 $\pm$ 67 ml/m^2, CI 4.1 $\pm$ 0.8 l/min/m^2, CPP 77 $\pm$ 16 mmHg; after infusion: GEDVI 720 $\pm$ 79 ml/m^2 ($p < 0.05$), CI 5 $\pm$ 1 l/min/m^2 ($p < 0.05$), CPP 85 $\pm$ 16 mmHg ($p < 0.05$)]. $PbrO_2$ and cerebral metabolites concentrations remained unchanged [before infusion: $PbrO_{2(lesioned)}$ 28.1 (19.8;33.6) mmHg, $PbrO_{2(intact)}$ 26.7 (19.1;38.1), lactate/pyruvate ratio$_{(intact)}$ 26 (20;32), lactate/pyruvate ratio$_{(lesioned)}$ 29.5 (24;43.1); after infusion: $PbrO_{2(lesioned)}$ 27.5 (22.1;32.1) mmHg, $PbrO_{2(intact)}$ 30 (22.8;36.1), lactate/pyruvate ratio$_{(intact)}$ 26.7(21.6;31.2), lactate/pyruvate ratio$_{(lesioned)}$ 28.1 (25;34.9)]. Subgroup analysis showed, that in case of initial lactate/pyruvate ratio$_{(lesioned)}$ more than 30 and less than 100 HES infusion was accompanied by increase in pyruvate concentration from 76.5 (58.3;136.8) µmol/l to 99.5 (62.8;139.3) µmol/l ($p < 0.05$) and decrease of lactate/pyruvate ratio from 42.2 (35.6;64.3) to 33 (28.4;56) ($p < 0.05$) in "lesioned" brain tissue.

CONCLUSION. In case of impaired cerebral metabolism hypovolemia correction with HES 130/0.4/9:1 can improve glycolysis and oxidative phosphorylation in lesioned brain tissue.

0561

EARLY HYPERGLYCEMIA IN THE NATURAL HISTORY OF SEVERE TRAUMA PATIENTS IS A PROGNOSTIC FACTOR

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BACKGROUND. Intensive insulin therapy (IIT) may lead to a better outcome in severe trauma patients [1], but it should not be performed for a long period without a specific object because of the risk of hypoglycemia. The optimal target blood glucose (BG) level for IIT is unknown, and it remains to be determined that how long IIT should be continued. The purpose of this study was to determine the optimal target BG level and period for IIT.

MATERIALS AND METHODS. We retrospectively reviewed 404 cases with an injury severity score (ISS) of more than 15 that have been treated for more than 48 h between January 2004 and December 2007, and we divided the cases into a survival group and a non-survival group. We reviewed age, ISS, history of diabetes, nosocomial infection (NI), mortality, admission blood glucose (BG) level (mg/dl) and BG change during the first 7 days after admission. We did not adopt any insulin therapy protocol in this period, and the treatment of insulin was determined by attending staff. Univariate analysis by the paired t test was used and multivariate analysis by the stepwise method and likelihood ratios were used to identify prognostic factors.

RESULTS. 94% of the 404 trauma patients were victims of blunt trauma.

Mean (±SD) age and ISS were 46 ± 21.6 years, 25.1 ± 10.2, respectively, and 6.6% was a history of diabetes. The NI rate was 27.4%. Mortality was 8.1%. There were 371 cases in the survival group and 33 in the non-survival group. The non-survival group had a higher ISS and admission BG level (survival group vs. non-survival group: 24.1 ± 9 vs. 36.5 ± 15.1, $p<$ 0.001; 174.8 ± 72.5 vs. 211.67 ± 61.6, $p = 0.002$). The mean BG level during the first 3 days after admission was lower in the survival group. (147.2 ± 39.5 vs. 170.9 ± 42.2, $p = 0.004$). The cutoff value for the mean BG level during the first 3 days after admission according to the sensitivity specificity curve in relation the mortality was 150. We defined early hyperglycemia (EH) as a mean BG level during the first 3 days after admission of more than 150 mg/dl. The AUC of the ROC curve for mortality in EH was 0.661 ($p = 0.002$).

EH was significantly correlated with NI ($p = 0.015$). The independent prognostic factors for death were ISS (OR 1.05 [$p = 0.002$; 95% CI: 1.01–1.08]), GCS (OR 0.78 [$p < 0.001$; 95% CI: 0.7–0.87]), and EH (OR 3.13 [$p = 0.008$; 95% CI: 1.34–7.31])

CONCLUSION. IIT with a target BG level of less than 150 mg/dl should be performed for at least the first 3 days after admission of severe trauma patients.

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0562

SURVIVE AND MORTALITY IN SEVERITY BRAIN TRAUMA (CLINIC EXPERIENCE)

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BACKGROUND AND GOAL OF THE STUDY. Brain injury is an important part of overall injuries. The goal of the study was to assess the dynamic of head injury of ≤8 GCS during 2006 in our department.

MATERIALS AND METHODS. 112 patients were attended to our Critical Care Department for brain injury during 1 year. F/M ratio was 30/82, age 33.12 ± 8.42. Related to their GCS assessment they were presented as GCS 3–4 pts 36 patients, as GCS 5–6 pts 28 patients and as 7–8 pts 48 patients.

RESULTS AND DISCUSSION. Most of them were road casualties (90 patients). 38 of them had other important damages. 17 of the patients were operated for traumatic brain hematomas. Immediately after the attendance the patients were intubated, sedated and mechanically ventilated with Tidal volume 6–8 ml/body weight. CT-scans performed at the attendance showed 69% hemorrhagic contusion, 26% were massive hematomas and 5% only pronounced hypoxemic brain swelling. 26% of the patients were presented to the hospital in shock status. In 32 patients, Diclofenac was used as antiflogistic agent. Overall mortality was 54% (61 from 112). Mortality rate in-patients with GCS 3–4 pts was 94%, in-patients with 5–6 GCS was 53% and in the group with 7–8 GCS 25%.

CONCLUSION. The most frequent cause of brain injury in our patients was road casualties. The overall mortality was over 50%. In the patient, we use Diclofenac showed better recovery to other patients.

REFERENCE. Marini JJ, Wheeler AP (2006) Crit Care Med (the essentials-third edition) 568–573, 576–578

0563

THE CHANGES OF CEREBRAL HEMISPHERE PRESSURE GRADIENT IN PATIENTS WITH SINGULAR HEMISPHERE INJURY

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OBJECT. We investigate the changes of cerebral hemisphere pressure gradient after brain injury and the effects of craniotomy on the pressure gradient.

METHODS. Twenty-four patients with traumatic brain injury were included in this study. All patients received brain parenchyma pressure (BPP) monitoring. Each optic fibro sensor was introduced into each cerebral hemisphere via the frontal lobe. All patients underwent surgical craniotomy for evacuation of space occupying lesions such as cerebral hemisphere contusion, subdural, and/or intracerebral hematoma. Preoperative and postoperative BPP data at different time point were recorded and analyzed.

RESULTS. Before craniotomy, the BPP value of the injured hemisphere was significantly higher than that of the contrary hemisphere (25.7 ± 5.7 mmHg vs. 23.5 ± 5.4 mmHg, $t = 11.675$, $P = 0.0001$). After craniotomy, the mean BPP values of the patients who underwent craniotomy were similar to those of the contrary hemisphere (9.6 ± 4.9, 10.2 ± 4.6 and 13.5 ± 5.3 mmHg vs. 9.7 ± 4.5, 10.2 ± 4.5, and 13.3 ± 5.4 mmHg, respectively, $t = 0$, $P = 1$).The Postoperative hemisphere BPP values were lower than the preoperative ones.

CONCLUSIONS. BPP monitoring sensors should be introduced into the injured hemisphere, so that the valuable information can be timely showed. When the cerebral hemisphere has lesions such as injury and bleeding, such lesions become the source of elevated intracranial pressure and can result in the bilateral hemispheres pressure gradient. Craniotomy cannot only effectively lower the intracranial pressure, but also eliminate the BPP gradient; therefore, the oppressed brain tissue can be reposited.

0564

HEMODYNAMIC MONITORING DURING OPERATIONS ON POSTERIOR BRAIN FOSSA TUMORS

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Direct, multifactorial influence upon brain tissue during neurosurgical operations on posterior fossa tumors causes the development of centrogenuous reactions. The potential danger of them brings us about the necessity of current control over intraoperative hemodynamic.

AIM. To form a correct estimate of diagnostic value of PICCO monitoring in neurosurgical operations.

MATERIALS AND METHODS. In our investigation we enrolled 11 patients aged from 20 to 60 years? who had undergone neurosurgical operation on posterior brain fossa tumors. Total intravenous anesthesia was maintained with fentanyl, clonidin, propofol.

In all patients we carried out the monitoring of central hemodynamic and extra vascular lung water with PiCCOplus (Pulsion Medical System, Munich).

RESULTS. In 9 patients we observed centrogenuous reactions of the first type, manifestated as bradycardia and increase of arterial blood pressure. At that time we observed increase of cardiac output to 8.34 ± 0.77 l/min, cardiac index to 3.31 ± 0.14 l/min and decrease of peripheral resistance to 370 ± 42 din s cm^{-5}. All the indexes returned to the base line in 4–5 min after cessation of surgical activity. Extra vascular lung water stayed stable 4.6 ± 0.4 ml/kg.

In 2 cases we observed centrogenuous reactions of the second type. Hemodynamic changes had a lot in common with manifestations of the first type reactions. But the alterations were more prolonged and were accompanied with the increase of extra vascular lung water to 8.7 ± 2.1 ml/kg.

Those reactions could be caused by the direct irritation of diencephalon structures. The sympatic nerves irritation caused spasm of lung arterioles and increased pulmonary capillary wedge pressure which led to lung edema.

CONCLUSIONS.

1. PICCOplus technology is safe, non-invasive and available method of monitoring in neuroanesthesiology
2. PICCO monitoring during neurosurgical operations on posterior fossa tumors is useful in diagnosis of hemodynamic disorders thus enable anesthesiologist to correct them timely.
3. PICCO monitoring is informative in revealing of occurring centrogenuous reactions and in determining of the bounds of surgical decency.

Nutrition 1: 0565–0577

0565

HIGH INCIDENCE OF SUB-CLINICAL UPPER GASTROINTESTINAL PATHOLOGY IN CRITICALLY ILL PATIENTS

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INTRODUCTION. Stress related mucosal disease (SRMD) is estimated to occur in between 75 and 100% of patients within 24 h of admission to Intensive Care [1]. This data is based on endoscopic findings in symptomatic critically ill patients, and reflects incidence before the targeted implementation of ventilator bundle protocols and stress ulcer prophylaxis.

Delayed gastric emptying occurs in up to 45% of ventilated patients, precluding successful enteral nutrition via nasogastric tube [2]. This necessitates the use of prokinetics or post-pyloric feeding. On our mixed medical and surgical unit, post-pyloric feeding tubes are inserted under direct vision using oesophago-gastro-duodenoscopy (OGD), allowing us to report the rate of incidental upper gastrointestinal (GI) pathology in a group of critically ill patients with no overt upper GI symptoms.

OBJECTIVES. To provide an updated prevalence of upper GI pathology in asymptomatic intensive care patients compliant with best feeding and ulcer prophylaxis guidelines.

METHODS. Endoscopic reports and medical records of all patients undergoing upper GI endoscopy to place post pyloric feeding tubes between 1997 and 2008 were examined. Patients who required urgent endoscopy for GI bleeding and those with an admitting diagnosis involving upper GI pathology were excluded. Apart from failed gastric feeding, patients had no other upper GI symptoms.

RESULTS. 120 patients underwent OGD for placement of post pyloric feeding tubes. Incidental pathology was identified in 32 patients. There was no difference in age (59.8 ± 16.7 years vs. 61.6 ± 15.4 years $p = 0.58$), APACHE II scores (19.5 ± 7.2 vs. 18.7 ± 6.2, $p = 0.57$) or LOS (19.7 ± 16 days vs. 18.8 ± 15.6 days, $p = 0.77$) between the groups. Pathology was identified as follows (n): oesophagitis (12), gastritis (10), duodenitis (1), gastric ulcer (4), duodenal ulcer (1), hiatus hernia (3) and bile reflux (3). 29 out of 32 (91%) patients were receiving standard antacid protection. Of the 28 patients with SRMD, 8 (29%) were receiving corticosteroids or non-steroidal anti-inflammatory drugs; 7 of these were already receiving either intravenous ranitidine or omeprazole. 18 of the remaining 20 patients with SRMD were already compliant with best stress ulcer prophylaxis.

DISCUSSION. This observational study demonstrates that over a quarter of critically ill patients have significant but asymptomatic upper GI pathology, which is mainly inflammatory in aetiology. This is despite good compliance with evidence based feeding and ulcer prophylaxis guidelines.

CONCLUSIONS. Delay or failure to absorb gastric feed is associated with a high incidence of SRMD, and should prompt OGD at an early stage. Larger studies are needed to examine the morbidity and mortality of SRMD in asymptomatic, critically ill patients.

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0566

THE APPLICATION OF EARLY ENTERAL NUTRITION VIA NASO-JEJUNAL CATHETER IN THE TREATMENT OF SEVERE ACUTE PANCREATITIS

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INTRODUCTION. Some researches have proved that early enteral nutrition may have positive effects in the treatment of severe acute pancreatitis (SAP), so have some experts recommended.

METHODS. Prospective, randomized, controlled study of patients with SAP for less than 48 h who underwent early enteral nutrition via naso-jejunal catheter placed in distal of Treitz ligament. A preset treatment goal was set (including somewhat vital signs and several routine tests), once the goal were reached in 5-day treatment, patients received 14-day enteral nutritional (EN) support with Elental or total parenteral nutrition (TPN).

RESULTS. From April 2006 to December 2007, 40 patients were enrolled and 27 patients completed the trial. After 14-day nutritional support, APACHEII and CT severity index (CTSI) showed a trend to decrease but no statistical difference was made in EN group, while serum albumin (ALB) in EN group was significantly higher and C-Reactive protein (CRP) was lower than TPN group. Infectious complications (including pneumonia, sepsis, peritoneal abscess and peripancreatic abscess) were lower in EN group, while no statistical difference was found in non-infectious complications (including ARDS/ARF, intestinal fistula, pancreatic fistula and pancreatic pseudocyst), surgical intervention or 30th day mortality. There was no difference in duration of ventilation, ICU stay or hospital stay between two groups, but cost of ICU stay was significantly lower in EN group.

CONCLUSION. Early EN via naso-jejunal catheter may prevent exacerbation of pancreatic necrosis and may improve condition of illness in SAP. Early EN do significantly improve nutritional condition in SAP. Early EN was associated with an decreased incidence of infectious complications and cost of ICU stay but not non-infectious complications, surgical intervention, 30th day mortality, duration of ventilation, ICU stay or hospital stay. Further researches with large sample capacities may be needed.

0567

"ANTICATABOLIC" NUTRITIVE SUPPORT IN THE ABDOMINAL SEPSIS PATIENTS: EFFICIENCY AND THE EXPEDIENCY

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INTRODUCTION. Hypermetabolism–hypercatabolism syndrome with the expressed resistance to the standard nutritive therapy develops in the course of the severity sepsis. In this case, there is a need in the nutrients decreasing the catabolic reaction, i.e. glutamine, arginine, omega-3-fatty acids.

MATERIALS AND METHODS. During 2005–2007 after the permission of the Ethic committee the study on the estimation of the efficiency of anti-catabolic nutritive support procedure was carried out in 66 surgical ICU patients with the abdominal sepsis (diffuse peritonitis, pancreatic abscess). Patients were divided into three groups: the first, 21 patients, the second, 25 patients, the third, 20 patients. Patients in the compared groups were identical in sex, age, and APACHE-II scale. The standard and anticatabolic support (the solution of alanine-glutamine dipeptide intravenously, L-glutamine into the tube) was used in Group 1, standard nutritive support from the 1st day was used in Group 2, and standard nutritive support from the 3rd day was used in Group 3. Albumin levels, nitrogenous balance, duration of ICU stay, and nosocomial pneumonia frequency were compared. The obtained results were processed statistically.

RESULTS. The data obtained are presented in Table 1

TABLE 1

Parameters	Group 1	Group 2	Group 3	$P<0.05$/ 3 (1–2)	$P<0.05$/ 3 (1–3)	$P<0.05$/ 3 (2–3)
Albumin, g/l						
5th day	29.35 ± 1.95	27.46 ± 2.39	21.18 ± 1.23		+	+
7th day	28.23 ± 1.72	27.23 ± 2.5	24.56 ± 1.49		+	+
Nitrogenous balance, g/day						
1st day	4.3 ± 1.46	-8.35 ± 1.73	-7.44 ± 1.59		+	
3rd day	3.23 ± 1.77	-4.14 ± 1.29	-7.56 ± 1.47		+	
5th day	1.48 ± 0.62	-2.15 ± 2.0	-6.09 ± 1.71	+	+	
Frequency of nosocomial pneumonia, %	4 (19%)	7 (28%)	9 (45%)	+	+	+
ICU stay (days)	8.12 ± 1.21	10.7 ± 1.76	14.47 ± 2.04		+	

Thus, the reliably higher level of albumin and nitrogenous balance during all stages of the study was observed in Group 1 patients as compared with other groups. The worst indices of protein metabolism were noted in Group 3 patients. The frequency of nosocomial pneumonia while "anticatabolic" nutritive therapy was 9 and 26% lower than that of the early and later nutritive therapy, respectively. The duration of ICU stay while using "anticatabolic" and the early nutritive therapy was 42 and 26% less than the later therapy.

CONCLUSION. It is appropriate to carry out the early anticatabolic nutritive therapy in the course of the abdominal sepsis.

0568

NUTRITIONAL SCORE RISK (NSR) TO EVALUATE RENAL FAILURE BASED ON RIFLE CLASSIFICATION

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INTRODUCTION. The hospital malnutrition is a universal problem that currently can be detected routinely and consequently combat effectively. It is observed both in developed countries and in the so called third world, unfortunately in ICU there is nothing universally accepted to do nutritional diagnosis on acute renal failure (RIFLE), therefore, the *aim* of our study has been applying a nutritional score risk to mortality in critically ill patients based on RIFLE classification.

METHODS.

Setting: We did a prospective observational research study from April 2007 to February 2008. Two hundred and eighteen admitted patients were included, the surveys were filled by the near relative who lived with the patient, at that moment that the relative showed non-coexistence with the patient and/or ignorance of its pattern of food ingestion during the newspaper the survey was discarded. Critically ill patients were selected at random with pathologies (neurocritical, Sepsis, trauma, patients, obstetrics critics, etc.) in 2 units of adult intensive cares. Patients were evaluated according to Nutritional Risk Score (NSR): has food intake declined due to loss of appetite, digest problems 2 points, How many full meals does the patient eat daily, less than two 3 points, At least one serving of dairy products, one serving of fruits and vegetables 2 points, takes more than 3 prescription drugs per day 1 point, how much alcohol per week 2 points, mode of feeding unable to eat without assistance 2 points, weigh loss or increase in the last 6 months 2 points, Economical level for eating 4 points

Statistical analysis: A validation of the data was used to assess the ability to the new Nutritional Risk Score to predict mortality in ITU based receiver operating characteristic (ROC) analysis. The statistical analysis was carried out with the SPSS 10 package, and $p < 0.05$ was considered statistically significant.

RESULTS. The final nutritional assessment was completed for 42 (15.6%) patients, and NSR in 26 patients. 28 (66.6%) were male and 14 (33.3%) were female. Age average was 67.6 years and NSR 7.57 ± 3.75, and APACHE II score 15.8 ± 7. ROC analysis were done for mortality according to NSR > 8 shows a sensibility of 72.7% (IC: 39.1–93.7) and specificity of 72.1% (IC: 44.9–92) with a +LR: 2.73, −LR: 0.37; +PV: 66.7, −PV:78.6, AUC: 0.72, IC: 0.51–0.87, $p = 0.0321$.

CONCLUSION. Nutritional Risk Score should be included in the Nutritional assessment for critically ill patients on RIFLE classification at admission to the intensive care unit in order to detect mortality by nutritional risk. In our study, we found that patients on RIFLE classification are in risk of mortality related to malnutrition. The patients not only have high average of NSR but also add a new risk factor to mortality to the risk created for the renal failure.

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0569

SUPPLEMENTAL PARENTERAL NUTRITION (SPN) IN ICU PATIENTS FOR EARLY COVERAGE OF ENERGY TARGET: PRELIMINARY REPORT HEIDEGGER CP, THIBAULT R, METHOT C, MAISONNEUVE N, JOLLIET P, DARMON P, ROMAND JA, PICHARD C

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INTRODUCTION AND AIMS. In ICU patients caloric intake deficit, and its associated complications, are often observed during Enteral Nutrition (EN). Supplemental Parenteral utrition (SPN) has been proposed to deliver 100% of the energy target in ICU patients from day 4 by combining EN+PN with the hypothesis that this approach could optimize their clinical outcome [1]. We report the 1-year preliminary results of a prospective, controlled, randomized clinical study, aiming at providing early coverage of energy target by SPN.

PATIENTS AND METHODS. Inclusion criteria were: mean caloric intake of the 3 first days after admission <60% of predicted energy targets (ESPEN guidelines); expected length of stay >5 days; expected survival >7 days; no contraindication to EN; patients not receiving PN; age >18 years. Patients were randomized to receive EN alone ("EN group") according to the usual local practice, or EN + PN ("SPN group") consisting in the administration of PN to reach the energy target of 100% by day 4 if EN alone was insufficient. The energy target was measured by indirect calorimetry (IC) and if not possible calculated by a 20–30/kcal/kg per day need.

RESULTS. One hundred patients were included. Thirteen patients (EN group, $n = 4$; SPN group, $n = 9$) were secondly excluded which left 87 patients for the analysis. Patients' admission diagnoses were: sepsis (31%); brain surgery (20%); cardiogenic shock (20%); trauma (14%). At inclusion, EN and SPN groups were similar for age (mean ± SD, 61.0 ± 12.1 vs. 61.6 ± 16.5, NS), sex (67% men vs. 82% female, NS), SOFA (5.9 ± 3.1 vs. 6.9 ± 3.5, NS) and BMI (27.9 ± 5.2 vs. 24.5 ± 5.3, P = 0.03). IC was performed in 46 patients (65%). The main reason for which the IC was not performed was FiO_2 >0.6 ($n = 15$, 21%).

TABLE 1 ENERGY DELIVERY (ED; MEDIAN ± IQ)

	ED day 4 (% target)	ED day 5 (% target)	ED day 6 (% target)	ED day 7 (% target)	ED day 8 (% target)	ED day 4–8 (% target)
EN ($n = 45$)	56.0 ± 32.3	82.5 ± 45.5	83.5 ± 30.0	90.5 ± 30.0	93.0 ± 31.0	80.0 ± 31.7
SPN ($n = 42$)	94.0 ± 30.0	97.0 ± 18.0	97.5 ± 22.0	99.0 ± 31.0	99.0 ± 16.0	98.0 ± 19.0
P value	<0.0001	0.002	0.13	0.16	0.42	0.001

CONCLUSIONS. These preliminary data confirm that EN alone delays the delivery of the energy target in ICU patients and that SPN allows successfully covering the energy target by day 4.

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0570

LOW NUTRITIONAL SCORE RISK IS A COST-EFFECTIVE PROCEDURE TO EVALUATE MORTALITY AT THE ADMISSION TO THE ICU

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INTRODUCTION. Low nutritional score risk (NSR) is a score of an increasing importance at the ICU, and specially mortality and days stay cost related. Based on cost procedures at the ICU, NSR is one of the fast and simple markers to be developed just thinking on it as a mortality marker at the admission to the ICU. Depending on the score value the patient could result more expensive during the stay at the ICU. These differences may imply a distinct utilization of health resources. Colombian registries comparing hospital cost of procedures at intensive care in critically ill patients have not been performed yet, although mortality score is prevalent procedure in this population.

AIM. To analyze hospital cost of being with malnutrition on ICU admission.

METHODS. One year data were collected and 81 patients participated in the study. From 81 patients admitted to the ICU, 56 (69.1%) have score <6, and 25 (30.86%) patients were on score ≥6. The total cost from the two groups was compared and cost-effective analysis was calculated. Cost variables analysed were: total management cost at the ICU, total cost per patient, cost-effective ratio (Alive patients were analysed as a final aim).

RESULTS. Mortality was the outcome variable that was studied to evaluate cost-effective ratio. Cost management of the group of patients with malnutrition at ICU admission was higher than the patients with good nutritional score. To reduce one death on the group of patients without malnutrition we should spend 247.97 USD. In other words, the cost to treat a patient with NSR ≥6 is 3.4 times higher than a patient with NSR <6 (Table 1).

TABLE 1 NSR COST (1 USD = $ 2227.68 COLOMBIAN PESOS)

Cost variable	NSR <6 to reduce mortality (USD)	NSR >6 versus mortality (USD)
Number of patients	56	25
Death patients	10	4
Total cost ICU management	$ 1,423,001,517 (638,781)	$ 986,280,241 (442,738)
Total cost per patient	$ 25,410,741 (11,406)	$ 39,451,209 (17,709)
Cost-effective ratio	$ 552,407 (247,97)	$ 1,878,629 (843,31)

CONCLUSION. Although the number of patients included was small, this study shows an approach of the importance of hospital cost in patients with nutritional score to define mortality at admission at the ICU in Colombia. Besides, was clear the cost-effective difference to manage a patient without malnutrition score. South America countries should start to spend more effort to reduce cost and focus on being clear on definition nutritional risk at the ICU, and NSR it is indicated to know mortality risk and cost management. This is a way of taking the first step for projecting health costs.

0571

PROGNOSTIC VALUE OF DELTA OF PREALBUMIN IN CRITICALLY ILL PATIENTS

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INTRODUCTION. Critical illness is characterized by a hypermetabolic stress state in which patients most commonly demonstrate systemic inflammatory response syndrome (SIRS) and associated complications of increased infectious morbidity, multiorgan dysfunction syndrome (MODS), prolonged hospitalization, and excessive mortality. In a recent past nutritional support was regarded as adjunctive care designed to provide exogenous fuel to support the patient until the metabolic response had resolved and as an attempt to prevent the adverse outcome associated with protein calorie malnutrition. More recently, the provision of early nutrition has become to be seen as a proactive therapeutic strategy by which the clinician may actually attenuate disease severity, reduce metabolic complications, and benefit patient outcome. Prealbumin (PA) value are considered one of the gold standard for assessing and monitoring the nutritional status on admission of a critical ill patients. By tracking PA levels, we can identify nutritional deficiencies early and help our patients recover more quickly and try to lower risk of complications. The normal value of PA in adult population is 16–45 mg/dl.

DESIGN. Prospective trial from November 2008 to April 2009.

METHODS. We conducted a prospective trial in the ICU. We describe demographics variables: age, sex, BMI, diagnosis, infection, nutrition type, APACHE II, SOFA, length of stay (LOS) and determine at admission and day 8th, PA, PCR, transferrin, protein intake, total calories, renal function. We analyze the data with SPSS v.15.0

RESULTS. Total patients (p) N = 60. 28 p with PA ≤ 10 mg/dl (high risk for malnutrition) and 32 p with PA ≥ 10 mg/dl. The mortality was 25% for the total population. A delta of PA ≤ 8 mg/dl during the first 8 days in the patients at high risk for malnutrition was associated with mortality ($p = 0.003$) with a sensibility of 75% and specificity of 60% (AUC = 0.75). A higher protein intake at day 8th was associated with survival ($p = 0.01$). We did not found any statistical difference in the value of PA at admission between the survivors and non-survivors.

CONCLUSIONS. A delta of PA ≤ 8 mg/dl during the first 8 days in the patients at high risk for malnutrition (PA ≤ 10 mg/dl) was a predictor of mortality in critical ill patients.

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0572

NUTRITIONAL THERAPY FOR ACUTE RENAL FAILURE: A NEW APPROACH BASED ON "RIFLE" CLASIFICATION AT THE ICU

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INTRODUCTION. Yet there is no consensus on the amount of dysfunction that defines acute kidney injury. The variety of definitions used in clinical studies may be partly responsible for the large variations in the reported incidence ranging from 1% up to 31% and the associated mortality (from 19 to 83%) as a result of acute kidney injury. To establish a uniform definition for acute kidney injury, the Acute Dialysis Quality Initiative formulated the Risk, Injury, Failure, and Loss, and End-stage Kidney (RIFLE) classification.

AIM. To analyze nutrition therapy based on new ARF classification.

METHODS. In our ICU, we have evaluated patients with ARF for nutritional support according to the RIFLE classification. The population was analysed from March 2007 to February 2008. During the 12-month study period, 670 adult patients were admitted to ICU, and 269 (40.14%) patients met the eligibility criteria. Of these patients, 49 (18.2%) were classified according to "RIFLE": 21 patients (7.8%) were RIFLE-R, 10 (3.71%) were RIFLE-I, and 18 (6.69%) RIFLE-F, from 42 patients 40.4% had septic shock.

RESULTS. The final nutritional assessment was completed for 42 (15.6%) patients, of whom 28 (66.6%) were male and 14 (33.3%) were female. Their mean age was 67.6 years and APACHE II score 15.8 ± 7. Nutritional assessment parameters were: body weight 70.3 ± 10.3 kg, body mass index 25.6 ± 3.2 and energy requirements calculated according to Harris Benedict was 1,333.2 ± 140.7. Among the 'RIFLE' group of patients, 36 (85.7%) were given any form of nutritional therapy [Enteral Nutrition (EN), PN or both]. 19 (45.2%) received EN, 6 (14.2%) received PN, 4 (9.5%) a combination of both, 1 (2.4%) oral feeding, and 6 (14.3%) no nutritional support. All EN was delivered via the stomach. Parenteral Dipeptide Glutamine was supplied in 8 (19%) of patients and. Average protein delivery 51.8 ± 30.9 g (Table 1).

TABLE 1 NUTRITIONAL THERAPY ON RIFLE

Variable	Yes	No	p
Death	17/36	1/6	0.33
Nosocomial infection	13/36	1/6	0.64
LOS (days)	24.2	25	0.053
Mechanical ventilation (days)	14.3	4.25	0.12

CONCLUSION. Until now nutrition therapy in the ICU has always been seen as supportive nutritional supplementation for patients with or without renal failure, rather than therapeutic. However, it may now be approached from a different point of view, based on a new classification of critical illness specifically for ARF. Our new focus facilitates a broader and more flexible therapeutic management of ARF if patients are first categorized according to RIFLE. Nutrition therapy based on RIFLE gives us the option to treat patients dynamically. One day a patient can be categorized as RIFLE F with restrictions on protein intake, but the next day he/she could be on RIFLE R with less nutritional restriction. This novel approach for nutrition therapy in critically ill patients with ARF is now our preferred approach.

0573

MODULATION OF THE FATTY ACID PATTERN, AND INFLAMMATORY RESPONSE BY THE USE OF A FISH OIL ENRICHED LIPID EMULSION (SMOF®) SECONDARY TO MAJOR SURGERY—A COMPARISON TO AN OLIVE OIL BASED LIPID EMULSION IN PARENTERAL NUTRITION

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INTRODUCTION./OBJECTIVES. Lipid emulsions provide energy and essential fatty acids to patients requiring parenteral nutrition (PN) [1]. The aim of this study was to assess the effects of a new lipid emulsion based on soybean oil, medium-chain triglycerides (MCT, source: coconut oil), olive and fish oil (SMOFlipid®) compared with a lipid emulsion based on olive and soybean oil (ClinOleic®) on fatty acid pattern and inflammatory response in postoperative intensive care unit patients.

METHODS. After approval of the ethical committee, 44 postoperative surgical patients with an indication for PN were included in this prospective randomised study. Non-protein calories were given as 60% glucose and 40% lipids. The total energy intake per day was 25 kcal/kg body weight. Patients were thus allocated to one of two nutritional regimens: Group A ($n = 22$) received SMOFlipid® 20% (SMOF group), group B ($n = 22$) a lipid emulsion based on olive and soybean oil (ClinOleic® 20%, control group; CG). PN including lipids were given for five postoperative days. Vascular cell adhesions molecule (VCAM), tocopherol (TCP), eicosapentaenoic acid (EPA), docosahexaenoic acid (DHA) were measured before the start of infusion (d0), at day 2 (d2) and day 5 (d5) after the start of administration and the ratio of EPA and arachidonic acid (AA; EPA/AA) as well as the ratio of interleukin-6 (IL-6) and interleukin-10 (IL-10; IL-6/IL-10) were calculated. The significance level was defined at $p < 0.05$.

RESULTS. There were no significant differences in VCAM-levels at d0 (SMOF: 1,408 ± 684 vs. CG: 1410 ± 719 ng/ml) and d2, whereas at d5 significantly lower VCAM-concentrations were seen in the SMOF group (1,401 ± 544 ng/ml), compared with the CG (2,046 ± 932 ng/ml). The inflammatory response objectified by calculation of the IL-6/IL-10 ratio differed also significantly at d5 (SMOF: 8.2 ± 8.4; vs. CG: 16.2 ± 14.2). Significant higher levels of EPA (d2: SMOF 112 ± 93 vs. CG: 22 ± 11 µmol/l; d5: SMOF 140 ± 93 vs. CG: 26 ± 12 µmol/l), DHA (d2: SMOF 162 ± 126 vs. CG: 97 ± 37 µmol/l; d5: SMOF 163 ± 75 vs. CG: 91 ± 29 µmol/l) and TCP (d2: SMOF 13 ± 4 vs. CG: 10 ± 5 mg/l; d5: SMOF 16 ± 4 vs. CG: 12 ± 4 mg/l) at d2 and d5 were observed in the SMOF-group compared with the CG. Significant differences of the EPA/AA-ratio were calculated at d2 (SMOF: 0.26 ± 0.22 vs. CG: 0.06 ± 0.02) and d5 (SMOF: 0.39 ± 0.16 vs. CG: 0.07 ± 0.03).

CONCLUSIONS. The administration of SMOFlipid® induced a significantly reduced pro-inflammatory response at d5 compared with a lipid emulsion based on olive and soybean oil. At d2 and d5 EPA, DHA, and TCP-concentrations as well as the EPA/AA-ratio were significantly higher in patients receiving a fish oil containing lipid emulsion suggesting a beneficial effects on the immune response.

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GRANT. The study was supported in part by Fresenius Kabi, Germany.

0574

ROLL OF PARENTERAL GLUTAMINE SUPPLEMENTATION ON PATIENTS' OUTCOME IN THE SURGICAL INTENSIVE CARE UNIT (SICU)

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Glutamine (Gln) was considered a nonessential amino acid. During the excessive organ/tissue demand of Gln in episodes of stress following trauma, major surgery, endogenous Gln production will not be sufficient to meet the increased requirements. After major GIT surgery, as a treatment of cancer, combined enteral and parenteral nutrition is used to supply the nutritional requirement for these patients.

AIM OF THE STUDY. The aim of the study was to evaluate the effect of Parenteral Glutamine Supplementation on the outcome of surgical cancer patients after GIT surgery.

MATERIAL AND METHOD. The study was done on 40adult patients admitted to the SICU, requiring TPN for at least 5 days because of inadequate or failure of enteral nutrition.

EXCLUSION CRITERIA. Persistent hemodynamic instability, renal insufficiency or hepatic failure. The patients were randomly assigned to two groups:

Control (C group) 20 pts: patients receive nutritional support as usual protocol. Glutamine (Gln group) 20 pts: patients receive nutritional support as usual protocol + Dipeptiven 300 mg/day for 7 days. Regimens supplied as constant intravenous infusion over 24 h via central veins. Standard vitamins, trace elements, electrolytes and insulin therapy were supplied according to the usual practice.

The rate of nosocomial infection and/or wound infection (each site of infection was considered as a separate infectious episode), ICU and total hospital length of stay, severe hyperglycemia (defined as a blood glucose level 12 mmol/L) and days of mechanical ventilation were recorded.

RESULTS. There were no difference between groups in demographic data and metabolic and nutritional parameters. Numbers of diabetic patients, included in both groups were not significantly different. There was also no difference in the duration of TPN (6.1 ± 1.1 vs. 6.3 ± 1.1 days for Gln and control group, respectively).

Incidence of pneumonia, surgical wound infection, sepsis, urinary or intravenous catheter infection was significantly lower in Gln group compared to control group. Days of mechanical ventilation among ventilated patients and ICU LOS were significantly lower in Gln group compared to control group

Nitrogen balance was more negative in control patients than in Gln supplemented patients, but the difference was insignificance. Hyperglycemia was reported in 4 Gln-treated patients and in 9 control patients, but required insulin therapy in 2 versus 8 patients. Total plasma amino acids concentrations and Glutamine plasma level increased about 40% in patients receiving Gln supplementation.

The number of adverse events per patient was significantly lower in Gln group (2.0 vs. 2.8; $p < 0.01$).

CONCLUSION. We have shown that Parenteral Gln supplemented TPN reduces the clinical complications of surgical patients, mainly through a lower incidence of pneumonia and the better metabolic tolerance. This is a strong rationale for the use of Gln-supplemented regimens for SICU patients.

0575

HOW TO ASSESS SUCCESSFUL NUTRITIONAL REQUIREMENTS WHEN ENTERAL NUTRITION FAILS?

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OBJETIVE. To assess the requirements of complementary parenteral nutrition (CPN) for a goal of 20–25 kcal/kg per day in medical critical care patients.

PATIENTS AND METHODS. Retrospective observational study made in a University Hospital Critical Care Unit from 2006 to 2008. The patients received enteral nutrition (EN) as first nutritional support, and only when less than 75% of the dose was absorbed complementary parenteral nutrition was added. Enteral nutrition was maintained, if possible, even when only a small amount of it could be tolerated. The additional parenteral nutrition was stopped when the EN was greater than 75% of the total dose.

RESULTS. 157 patients received complementary parenteral nutrition. All of them had early enteral nutrition as first nutritional support, but at some point of their ICU stay they needed CPN. 19.74% were respiratory illnesses, 17.8% trauma, 17.8% neurocritical, 16% septic shock, 10.2% cardiac surgery, 7.6% pancreatitis, 3.8% liver disease. The reasons for CPN were high residual gastric volume (75%), abdominal distension (18%), and diarrhoea, vomits and digestive haemorrhage (7%).CPN was started on day 6.8 ± 5.9 and needed for an average of 3.8 ± 1.7 days. The time of CPN was longer in patients with respiratory problems (4.4 ± 1.9) and septic shock (4 ± 1.3), compare with neurocritical care patients (3.3 ± 2.4, p: 0.018).

CONCLUSIONS.

1. Unsuccessful enteral feeding in the ICU happened between days 7 to 10, when having a correct nutritional support is a key point.
2. The average time of CPN is significantly higher in respiratory patients and septic shock, which correlates with higher morbidity and mortality.
3. When nutritional requirements have not been completed with enteral feeding complementary parenteral nutrition may be an option to avoid secondary problems due to nutritional impairment.

0576

EVOLUTION OF NUTRITIONAL SUPPORT FOR 12 YEARS IN A SURGICAL CRITICAL CARE UNIT AS QUALITY CRITERION

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INTRODUCTION. The Classic Nutritional support in postoperative patients has been total parenteral nutrition (TPN), but this type of nutrition is changing based on quality criteria described on international nutritional guidelines.

OBJECTIVE. To compare the nutritional support in postoperative patients in two different periods as quality criterion.

PATIENTS AND METHODS. Retrospective observational study made in a University Hospital surgical critical care unit, from 1997 to 2008. Two different periods were evaluated, phase I from 1997 to 2002 and phase II from 2003 to 2008. For 12 years the type of nutritional support received by postoperative patients staying in a surgical critical care unit was recorded. Different type of surgery was included such cardiac surgery, thoracic surgery (included lung transplantation), neurosurgery, abdominal surgery (liver transplantation included), and vascular surgery. The patients were analyzed in four different groups, based on nutritional requirements:

- Group 1: Postoperative patients with normal functional gut.
- Group 2: Postoperative patients with a jejunostomy
- Group 3: Abdominal surgery and patients with long term ventilation.
- Group 4: TPN in nourished patients and TPN for a period inferior to 5 days (vascular surgery).

RESULTS. 4,534 patients have been recorded for 12 years, 2,364 from 1997 to 2002 and 2,170 from 2003 to 2008. 67% received TPN, 21% enteral nutrition (EN) and 12% mixed nutrition (TPN plus EN). When we compared the type of nutrition for groups on both periods:

1: EN increased 13.5% (p: 0.001), mixed nutrition decreased 9.5% (p: 0.038) and TPN decreased 5% (ns)

2: EN increased 32% (p: 0.001), mixed nutrition decreased 17% (ns) and TPN decreased 14.5% (ns)

3: Mixed nutrition increased (p: 0.017) and EN and TPN decreased (ns)

4: TPN decreased 50%, and during the second period an annual reduction of 63% was observed during the first 3 years and a reduction of 80% in the other three.

TPN prescribed for less than 5 days was found only in 2% of this kind of patients in the last 3 years.

Based on the type of surgery, patients who underwent thoracic surgery received 32% (p: 0.001) more EN from phase I to phase II, mixed nutrition decreased 17.6 and (p: 0.012) and TPN 14.4% (p: 0.017). EN also increased in patients with liver transplantation, 12% (p: 0.019).

No changes in nutritional support were observed in neurosurgical patients, EN was prescribed in 80% and 83% of the patients in both phases.

CONCLUSIONS.

1. Enteral nutrition has increased as a nutritional support in patients who underwent thoracic surgery, and abdominal surgery, including liver transplantation.
2. Conducting jejunostomy has enhanced enteral nutrition in the immediate postoperative period.
3. Quality criteria has been followed in patients who underwent vascular surgery, with an important changed in nutritional support, decreasing TPN and TPN for less than 5 days.

0577

PROSPECTIVE RANDOMISED COMPARISON STUDY OF TWO METHODS OF JEJUNAL PLACEMENT OF ENTERAL FEEDING TUBES IN CRITICALLY ILL PATIENTS: ENDOSCOPIC VERSUS ELECTROMAGNETIC VISUALISED METHOD

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INTRODUCTION. Intragastric enteral nutrition is frequently associated with complications like reflux and vomiting. Therefore, in these patients international guidelines recommend placement of a jejunal feeding tubes to assure adequate enteral caloric supply. Jejunal feeding tubes can be placed in different ways. The endoscopic method gaining success rates of correct jejunal placement of over 90% is regarded as the gold standard. However, it is a sophisticated technique requiring trained staff. Non-endoscopic methods are mostly easier to apply though leading to success rates around 75%.

OBJECTIVE. To compare the success rate of correct jejunal placement of a new electromagnetic visualised jejunal tube with the endoscopic guided technique in a comparative ICU patient population.

METHODS. 66 mechanically ventilated patients with persisting intolerance of intragastric enteral nutrition (repeated vomiting, reflux >250 ml) were randomly assigned (2:1) to receive an electromagnetic visualised jejunal feeding tube (Cortrak™, CORPAK MedSystems) or an endoscopic guided jejunal tube (Freka® Trelumina, Fresenius-Kabi). Primary outcome measure was the success rate of correct jejunal placement after 24 h. Secondary outcome parameters were duration of placement, number of attempts, days in correct position (with maintained patency) and complications of placement (bleeding).

RESULTS. Data are given as mean ± standard deviation. $p < 0.05$ was regarded as statistically significant.

CONCLUSION. Success rate and duration of placement were not different between the two methods. Number of attempts was less with the electromagnetic visualised method. Days in correct position as well as complication rate were not different between the groups (Table 1)

TABLE 1

	Endoscopic method	Electromagnetic visualised method	*p*-value
n (m/f)	22 (18/4)	44 (27/14)	0.25
SAPS II Score	50 ± 16	52 ± 20	0.66
Success rate (%)	95	90	0.65
Time (min)	17 ± 9	15 ± 13	0.60
Number of attempts	1.9 ± 0.8	1.3 ± 0.8	<0.01
Days in correct position (d)	15 ± 8	14 ± 14	0.82
Complication rate (%)	18	17	1

Electrolytes, endocrinology, intoxications: 0578–0591

0578

HYPERNATRAEMIA IN CRITICALLY ILL PATIENTS

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INTRODUCTION. Hypernatraemia is common in ICU patients, is associated with greater severity of illness and mortality, and has been proposed as a marker of quality of care. We set out to determine the incidence of hypernatraemia in our ICU and to identify contributory factors.

METHODS. In our general medical and surgical ICU, we reviewed laboratory results from 50 ICU patients (excluding uncomplicated post-operative patients, and those admitted for <24 h) to determine the incidence of hypernatraemia. We defined hypernatraemia as serum $[Na^+] > 145$ mmol/l and significant hypernatraemia as $[Na^+] > 150$ mmol/l. For each episode of significant hypernatraemia, charts were examined for fluid intake; fluid output (urinary, GI, and estimated insensible losses); sodium intake (fluids, feed, and drugs); and diuretic use. We compared these variables between days in which sodium rose and days in which sodium remained constant or fell. We also noted diagnoses and outcomes, and whether mild hypernatraemia was present prior to episodes of significant hypernatraemia. Chi squared and *t* tests were used for analysis.

RESULTS. The incidence of hypernatraemia was 30% (15/50 patients). There were 11 episodes of significant hypernatraemia in 8 patients, 5 of whom subsequently died. Rising serum sodium was not associated with negative fluid balance ($P = 0.44$) but was strongly associated with higher sodium intake ($P = 0.0001$). Sodium intake ranged from 11.0 to 778.0 (mean 221.8) mmol/day: 45.5% from intravenous fluids (12.3–713.3 mmol/day), 10.1% from enteral or parenteral nutrition (1.4–89.5 mmol/day), and 44.4% from drugs (including diluents; 4.2–342.5 mmol/day). Diuretic use did not differ significantly between days on which sodium rose (8/28) and those on which sodium fell or remained constant (12/28) ($P = 0.61$). In 9 of 11 episodes, mild hypernatraemia ($[Na^+]$ 146–149 mmol/l) was present 24 h prior to sodium concentration rising above 150 mmol/l.

CONCLUSIONS. Hypernatraemia was common in our ICU, and associated with high mortality. Mild hypernatraemia was identified in most patients before serum sodium rose above 150 mmol/l, implying inadequate intervention for mild hypernatraemia. Of note was the lack of association between fluid balance and changes in serum sodium: this conflicts with the generally held view of hypernatraemia as a function of pure water deficit. In contrast, while a relationship between higher sodium intake and rise in serum sodium is not widely recognised, this appeared to be a major contributory factor in our patients. Sodium intake was in excess of nutritional requirements of 60–100 mmol/day with large contributions from both intravenous fluids and drugs with their diluents: very little was due to nutritional sodium intake. Our data demonstrate the need to consider total sodium intake in critically ill patients (particularly the sodium content of drugs including diluents, and intravenous fluids) when prescribing medication and enteral or parenteral nutrition.

0579

INCIDENCE AND PROGNOSIS OF DYSNATREMIAS PRESENT ON ICU ADMISSIONA PROSPECTIVE MULTICENTER COHORT STUDY

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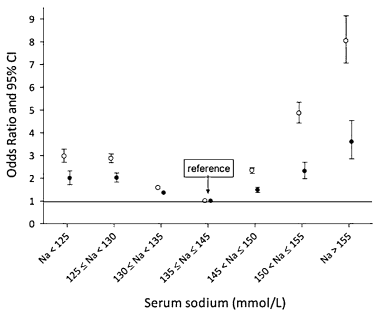
RATIONALE. Dysnatremias are common in patients admitted to the intensive care unit (ICU). It is not known whether the presence of disorders of sodium balance at the time of ICU admission is independently associated with excess mortality. Thus, we wanted to test the hypothesis that dysnatremias on ICU admission are independent risk factors for increased mortality in critically ill patients.

METHODS. We conducted a prospective, multicenter cohort study in 77 medical, surgical, and mixed ICUs in Austria, with a database of 151,486 adults admitted consecutively over a period of 10 years (1998–2007).

MEASUREMENTS AND MAIN RESULTS. Most patients (114,170, or 75.4%) had normal sodium levels on ICU admission. The frequencies of borderline, mild and severe hyponatremia were 13.8, 2.7, and 1.2%, respectively. The frequencies of borderline, mild and severe hypernatremia were 5.1, 1.2, and 0.6%, respectively. ICU length of stay was 3 (2–7) days. Overall ICU mortality was 12.0%, and overall hospital mortality was 17.6%. All types and grades of dysnatremia were associated with increased raw and risk-adjusted hospital mortality ratios. Multiple logistic regression analysis showed an independent mortality risk for both hyponatremia and hypernatremia. The risk of dying in hospital rose with the increasing severity of both hyponatremia and hypernatremia. Borderline hyponatremia ($130 \leq Na < 135$ mmol/L) and borderline hypernatremia ($145 < Na \leq 150$ mmol/L) were also associated with a substantially increased risk.

CONCLUSIONS. Our results provide strong evidence that both hypo- and hypernatremia present on admission to the ICU are independent risk factors for poor prognosis.



0580

INTENSIVE CARE ACQUIRED HYPERNATREMIA AFTER MAJOR CARDIACTHORACIC SURGERY IS ASSOCIATED WITH INCREASED MORTALITY

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INTRODUCTION. Hypernatremia is a common electrolyte disorder in the medical Intensive Care Unit (ICU) and was described to be an independent risk factor for mortality. Hypernatremia has not been studied in a collective of surgical ICU patients so far, therefore we wanted to determine the incidence of hypernatremia on a surgical ICU and its effects on outcome of surgical critically ill patients.

METHODS. In this prospective cohort study all patients admitted to the ICU after major cardiac surgery between May 1999 and October 2007 were included. Serum electrolytes, underlying disease and reason for surgery, SAPS II score, ICU length of stay, ICU mortality and hospital mortality were collected for all patients. Hypernatremia was defined as a serum sodium exceeding 145 mmol/L. To evaluate the potential impact of ICU-acquired hypernatremia on 28 day hospital mortality Cox's proportional hazards regression models were used.

MAIN RESULTS. 2,699 patients underwent major cardiac thoracic surgery during the study period, of which 2,314 were included in the study. 221 (10%) patients acquired hypernatremia during their ICU stay. Median onset of hypernatremia was on day 4 (2–7). Patients with ICU-acquired hypernatremia had a higher mortality (19%) compared to patients without hypernatremia (8%); $p < 0.0001$. Length of stay was increased in patients with hypernatremia (17 vs. 3 days). In a multivariate Cox regression ICU-acquired hypernatremia was an independent risk factor for mortality.

CONCLUSIONS. Hypernatremia is a common event early in the course of critical illness after major cardiothoracic surgery and has an independent effect on mortality. Future research should focus on the impact of hypernatremia on physiologic functions and on adequate and safe treatment of the electrolyte disorder.

0581

A PILOT STUDY OF THE EFFECTS OF COMBINED THERAPY WITH FRUSEMIDE AND SPIRONOLACTONE ON SERUM SODIUM AND NATRIURESIS IN CRITICALLY ILL PATIENTS

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BACKGROUND. Hypernatraemia is common in the intensive care unit (ICU) and can result in problems such as delirium, altered conscious state and seizures. Factors contributing to hypernatraemia include the administration of loop diuretics as treatment for fluid overload. Spironolactone is an aldosterone antagonist and promotes natriuresis. It is an established therapy for congestive cardiac failure.

OBJECTIVE. To assess whether the administration of spironolactone to ventilated patients receiving a frusemide infusion influences urinary sodium and potassium excretion and attenuates the tendency to hypernatraemia compared to placebo.

DESIGN. Randomised, double blind, placebo-controlled trial.

PATIENTS. 20 patients with serum creatinine <300 mmol/L on mechanical ventilation in intensive care within 24-h of commencing a frusemide infusion as treatment for fluid overload.

METHODS. In addition to standard therapy, patients were randomised to receive either spironolactone 100 mg three times daily or placebo by nasogastric tube for the duration of therapy with frusemide infusion. Daily levels of urea and creatinine, 24-h urine sodium and potassium, fluid balance and 24-h blood levels of aldosterone, hANP, PRA were measured throughout the duration of frusemide infusion therapy.

RESULTS. Change from baseline to maximum-recorded serum sodium was a median of 5 mmol/L for placebo versus 1 mmol/L for spironolactone ($p = 0.179$). Changes from baseline in serum potassium were minimal for both groups (maximal deviation less than 2.1 mmol/L) with no difference between the two groups. There were no significant differences in total urinary sodium or potassium excretion although a trend to higher urinary potassium excretion was evident in the group receiving placebo ($p = 0.230$). No differences in serum creatinine or urea levels, measured hormone levels, urine volume, daily fluid balance or frusemide dose emerged between the two groups.

CONCLUSIONS. The administration of high dose spironolactone to ventilated critically ill patients receiving frusemide by infusion has no significant effects on severity and incidence of hypernatraemia, natriuresis or potassium balance when compared to placebo.

0582

MANAGEMENT OF SEVER HYPONATREAMIA ASSOCIATED WITH PSYCHIATRIC MEDICATION AND DIFFICULT AIRWAY

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INTRODUCTION. Hyponatraemia is a common and important clinical problem that can be seen in isolation or associated with other medical illness. It may manifest with nausea, seizures, coma, cerebral oedema and even death [1]. Some of the psychiatric drugs can cause hyponatremia with characteristics of SIADH [2].

CASE REPORT. 65 years old Ms JK admitted through A&E with collapse and agitation. With background of psychiatric history with learning disability and blindness (Corneal opacity).

She was feeling sick and vomiting for 48 h. She was care dependent and over compliance with her medications.

Her antipsychotic medications were Fluoxetine, Chlorpromazine, Tolterodine SR and Diazepam.GCS was 11/15 on arrival, SpO_2 95% on room air. WCC 23.3, Na 99, K 3.1, Cl 60, HCO3 27, Urea 2.4, Cr 39, CK 2057. CT Brain showed old left parietal infarct. Few hours later, she desaturated with upper airway obstruction 2° to airway swelling. Decided to intubate in theatre, inhalational induction airway maintained with LMA and ENT surgeon standby, attempts made with intubating LMA/I Gel/Glidoscope eventually intubated with Bougie, cricoid pressure and pillow under shoulder. Hyponatreamia corrected slowly over 72 hrs.

LRTI was treated with antimicrobials. Because of her respiratory failure, difficult airway and learning disability she was failed to wean and she was offered tracheostomy on day 19th.

With in a week time she was weaned and discharges from ICU. Her tracheostomy downsized and removed and went home in 13 days.

DISCUSSION. A systemic review of SSRI associated with hyponatremia and SIADH found, fluoxetine is commonly causative agent and mechanism of action is not known [3]. Correction of hyponatremia is usually successful and although it must be done slowly to prevent irreversible osmotic demylination [4].

CONCLUSION. Among psychiatric patients hyponatremia is often associated with factors others than psychogenic polydipsia including medications and medical co morbidities.

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0583

COCAINE-INDUCED ACUTE RENAL FAILURE, THROMBOCYTOPENIA, AND ELEVATED LIVER ENZYMES

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BACKGROUND. Cocaine is a naturally occurring alkaloidal extraction of Erythroxylum Coca, a plant indigenous to South America. Cocaine abuse has been associated with multiple known adverse effects, including myocardial ischemia, cerebrovascular accidents, pulmonary edema, and mesenteric ischemia. However, the effects of cocaine on renal, gastrointestinal, and hematologic systems have not been extensively reported.

CASE PRESENTATION. A 51-year-old man without a significant past medical history was brought to the hospital with abdominal pain and nausea. He had consumed crack cocaine and ethanol the day prior to his admission. He denied using other recreational drugs. On admission he was found to be hypertensive (BP 170/100 mmHg) and tachycardic (HR 134/min). Physical examination revealed mild right upper quadrant tenderness without rebound. Laboratory investigations revealed a serum creatinine of 3.72, creatine phosphokinase (CPK) of 5885, lactate dehydrogenase (LDH) of 2964 and markedly elevated transaminases, ALT 331 and AST 462. Thrombocytopenia (platelet count 74,000) was also observed. A viral hepatitis panel was negative. Urine toxicology screening revealed cocaine. Urine myoglobin was highly positive. Serum bilirubin, alkaline phosphatase, amylase, and lipase were within normal limits. An electrocardiogram showed sinus tachycardia at a rate of 120 beats per minute. Radiographic imaging studies including CT scan of abdomen showed no evidence of pathology. A clinical diagnosis of cocaine toxicity was made and conservative management was initiated. Despite trending down of liver enzymes during the hospital course (ALT of 38 and AST of 60), he continued to have residual renal insufficiency (creatinine of 2.55), with a low platelet count (47,000), at the time of discharge.

CONCLUSION. This case illustrates some other complications pertaining to cocaine toxicity which are not well reported in the literature. In a patient with history of cocaine use presenting with these manifestations, cocaine itself should be considered as a likely cause. Physicians should be aware of these potentially life threatening effects of cocaine abuse.

0584

ROCURONIUM INDUCED CORTISOL SUPPRESSION

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INTRODUCTION. The use of intravenous anesthetic agents is known to suppress the hypothalamic, pituitary, adrenal axis. Opioid use decreases cortisol concentration and the combination of high doses of diazepam with fentanyl decreases the early release of ACTH and cortisol concentration suggesting the action of these agents on the hypothalamus.

OBJECTIVE. The present study was designed to research if the structural similarities between rocuronium (aminosteroid) and cortisol and lazaroids (21-aminosteroids) are accompanied with similar effects.

METHODS. Prospective study of efficiency of one arm. In 21 patients, serum cortisol was measured one day before the administration of rocuronium at 08:00 (K1) and 20:00 (K2). The day of administration serum cortisol was measured at 08:00 (K3) and 20:00 (K4). Urine cortisol was measured the day of the administration at 08:00(Ka) and 24 h later (Kb). Rocuronium was administered at a dose of 0.6 mg/kg

RESULTS. The mean between

K1 (22.6 ± 11.6) and K3 (20.1 ± 9.4), $p = 0.444$

K2 (16.2 ± 9.2) and K4 (18.9 ± 9.3), $p = 0.182$

KA (18.9 ± 9.3) and KB (38.6 ± 32.6), $p = 0.321$

CONCLUSION. With the current sample no significant difference was found in serum and urine cortisol at any time before and after a single dose of Rocuronium.

0585

RARE COMPLICATION OF INTERNAL JUGULAR VEIN CANNULATION FOR HAEMODIALYSIS

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INTRODUCTION. IJV cannulation has become the preferred approach for temporary haemodialysis catheter placement following reports of an increased incidence of subclavian stenosis due to subclavian vein catheterization. The most common complication of IJV cannulation is internal carotid artery puncture. Other known complications are pneumothorax, vessel erosion, thrombosis, bleeding, airway obstruction due to haematoma and infection. Rare cases of thyrocervical trunk pseudoaneurysm, right common carotid artery fistula, brachial plexus compression due to subclavian artery pseudo aneurysm are reported in literature.

OBJECTIVES. To report a rare case of complication of IJV cannulation for haemodialysis where inadvertent right carotid artery cannulation occurred and the complex yet meticulous management offered to this patient.

METHODS. A 70-year-old gentleman whose right carotid artery got cannulated was subjected to uneventful removal of this catheter after percutaneous insertion of an endovascular covered stent graft in the right carotid artery.

RESULTS. Our patient had a rare but dreaded complication of haemodialysis cannula insertion and underwent a very meticulous management of this complication

CONCLUSION. Haemodialysis cannula insertion complications are known but carotid artery cannulation is a rare and dreaded complication. It can be managed by percutaneous endovascular covered stent graft with no untoward effects.

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0586

ANTITHROMBOTIC PROPHYLAXIS IN CRITICALLY ILL PATIENTS WITH RENAL FAILURE

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INTRODUCTION. Deep venous thrombosis with subsequent pulmonary embolism or postthrombotic syndrome is a feared complication in the intensive care unit. Therefore, routine prophylactic anticoagulation is widely recommended. Like other critically ill patients, patients with renal insufficiency face an increased risk of DVT, at the same time, they are also predisposed to bleeding because of uremic platelet dysfunction, multiple comorbidities, coagulopathies, concomitant treatment with antiplatelet or anticoagulant agents.

OBJECTIVE. The objective of this study was to assess the prevalence of renal failure among critically ill patients and the use and dosage of antithrombotic prophylaxis in these patients. Also, we estimated the incidence of major and minor bleeding by daily clinical assessments.

METHODS. In a cross sectional study carried out at four different critical care units at a same hospital, information on all critically ill patients was collected. Data on the proportion of patients with renal failure, on the type, use and dosage of antithrombotic prophylaxis were ascertained.

RESULTS. 156 charts were examined. 70 patients (46%) had renal disfunction. There was no difference in the rate of prescription of antithrombotic prophylaxis between patients with and without renal failure ($p = 0.81$ and $p = 0.94$, respectively). DVT developed in seven patients, five of them in the renal failure group. In patients with renal failure, 52 patients received prophylaxis with unfractionated heparin and 18 patients received enoxaparin ($p < 0.01$). There was no episode of major bleeding. There were 10 episodes of minor bleeding, all of them in the group of renal failure patients. Independent risk factors for major bleeding was aspirin use (hazard ratio, 6.30; 95% CI 1.35–29.4) and enoxaparin use (hazard ratio, 1.68; 95% CI 1.07–2.66).

CONCLUSION. Renal failure is frequently present in critically ill patients using thromboprophylaxis. This therapy can be associated with minor bleeding in this subgroup of patients.

0587

PATTERNS OF STROKE VOLUME VARIATION DURING CONTINUOUS RENAL REPLACEMENT THERAPY: A CASE REPORT

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INTRODUCTION. One of the most common complications of Continuous Renal Replacement Therapy (CRRT) in critically ill patients is hypotension. The amount and rate of fluid removal are both important factors related to this complication.

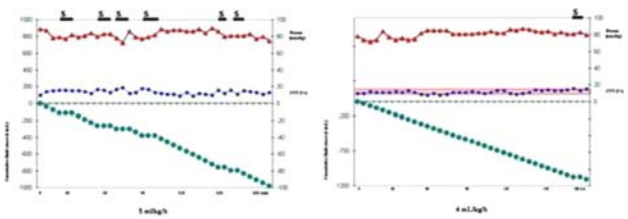
OBJECTIVES. Here we report a case which demonstrates how the amount and rate of fluid removal during CRRT affect conventional haemodynamic parameters and dynamic indices of fluid responsiveness (e.g. Stroke Volume Variation, SVV).

METHODS. A sensor which provides pulse contour analysis parameters was connected to our patient's arterial line. Stroke volume, SVV and cardiac output were displayed on one monitor while the conventional haemodynamic parameters appeared on another. After the stabilization of the intravascular fluid volume of our patient (defined as achieving a SVV 10% for at least 5 min) we performed 3 h of fluid removal with two different rates on each of two consecutive days. On Day 1, we increased the removal rate to 5 ml/kg per hour and on Day 2, to 4 ml/kg per hour. If/when SVV exceeded 15%, fluid removal was suspended until SVV returned back into the 10–15% range. Continuous data was recorded at 5 min-intervals, while static parameters in 30 min-intervals.

RESULTS. On Day 1 (fluid removal rate of 5 ml/kg per hour), our patient had 6 episodes in which SVV increased to >15% (marked as "S" in Figure/left). As a consequence, fluid removal needed to be stopped 6 times during the 3 h period. SVV and mean arterial pressure (Pmean) always changed in a parallel manner during the study. These changes were not reflected in the values of CVP and SVRI. Total fluid removed in 3 hrs was 985 ml. On Day 2 (fluid removal rate of 4 ml/kg/h), the patient was more stable. Fluid removal was interrupted only once (Figure/right).

Total fluid removed in 3 h was 1110 ml. These results suggest that for this particular patient at this particular time 4 ml/kg per hour fluid removal rate was more optimal than 5 ml/kg per hour.

CONCLUSION. The use of dynamic indices of fluid responsiveness such as SVV may help customize RRT treatments for individual patients, allowing them to optimise amount and rate of fluid removal.



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0588

THE KINETICS OF THE PANCREATIC HORMONE IN TRAUMATIZED PATIENTS

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PURPOSE. The kinetics of the pancreatic hormone glucagon in traumatized patients has not been minutely investigated as well as that of insulin, despite its significant influence on energy metabolism. In the present study, we examined the kinetics of glucagon and glucagon-related peptides assessed by radioimmunoassay, and the molecular forms of these peptides using gel filtration chromatography. In addition, we discuss glucagon processes in the pancreas and intestine in traumatized patients in the early operative days.

METHODOLOGY. Twelve traumatized patients who had undergone emergency surgery were enrolled in this study (group S). Ten healthy volunteers were also enrolled as normal control subjects (group C). The serum level of glucagon and glucagon-related peptides were assessed in the early morning fasting state in both groups, on the second postoperative day in group S, using the glucagon nonspecific N-terminal (glucagon-like immunoreactivity [GLI]) and specific C-terminal [immunoreactive glucagon (IRG)] radioimmunoassays. The molecular forms of these peptides were also estimated using the gel filtration chromatography method.

RESULTS. Serum IRG in group S was significantly high compared with that of group C ($P < 0.05$). Serum GLI was not significantly different between both groups. In all 12 patients in group S, a peculiar glicentin-like peptide (GLLP: MW approximately 8,000 Da) other than pancreatic glucagon was seen on gel filtration chromatography, which was not seen in group C.

CONCLUSIONS. The kinetics and processing of glucagon in traumatized patients was different from those of healthy subjects. In traumatized patients, the peculiar processing of glucagon was processed in the intestine, which is different from the ordinary glucagon processing either in the pancreas or the intestine, generating the peculiar glicentin-like peptide (GLLP).

0589

METFORMIN-ASSOCIATED LACTATACIDOSIS (MALA) A REAL CHALLENGE IN NEPHROLOGICAL INTENSIVE CARE MEDICINE

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Between January 1 and December 31, 2008 in our 14-bed intensive care unit we took care of 983 patients. Within this period we treated nine patients (0.9%, four male, five female, median age 64 years, range 54–80 years) with severe Metformin-associated lactatacidosis (MALA).The pH in the first arterial blood gas rayed between 6.72 and 7.06, pCO_2 6 and 27 mmHg, HCO_3^- between 1.1 and 6.5 mmol/L, and the base excess between −22 and −32 mmol/L. The anion gap was elevated in all patients (18–40 mmol) as was the blood lactat level (90 up to 350 mg/dl). Seven patients were dehydrated due to a gastro-enteric infection; two patients had taken Metformin for suicide. The blood level of Metformin was elevated in eight patients, in one patient the level was within normal range. On admission all patients suffered from acute kidney injury grade 3 (eight RIFLE F, one RIFLE I). The APACHE II score rayed between 18 and 39 points. On admission to our ICU five patients needed vasopressor therapy, three patients needed mandatory ventilation. We started fluid resuscitation (10–26 L of crystalloids/48 h) and immediate continuous venovenous hemodialysis over a period from 7.5 up to 37 h. All patients could be stabilized. In a recent Cochrane review pooled data from 274 comparative trials and cohort studies revealed no cases of fatal and nonfatal MALAs in 51627 patient-years of metformin use. Thus, the causal relationship between metformin use and MALA has been discussed

Without questioning the benefits of metformin therapy in type 2 diabetes, we wish to emphasize that there are some contraindications to its use, stressing the importance of renal clearance and the possibility of an unpredictable acute renal injury as a result of for example a dehydration episode.

Patients should be sensitized for signs and symptoms of lactatacidosis like dyspnoe, tachycardia, loss of consciousness and Metformin therapy should be cancelled immediately in any kind of gastro- enteric infection or renal dysfunction.

0590

SODIUM VALPROATE TOXICITY, A NOVEL APPROACH

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INTRODUCTION. Drug overdoses account for 3.8% of admissions to Intensive Care Units and anti-epileptic drugs are relatively common agents in intentional overdoses [1, 2]. We use a case report of sodium valproate overdose to illustrate the biochemical management of potentially fatal hyperammonemia.

CASE REPORT. A 43-year-old man presented with a 40 g sodium valproate overdose. On admission he was unresponsive and hypotensive. His valproate level was 1470 mg/L (death being associated with levels greater than 1,000 mg/L) and plasma ammonia was 850 μmol/L [3]. Despite support for multiple organ failure, he deteriorated with increasing haemodynamic instability and worsening lactic acidosis. Treatment was initiated to specifically reduce the valproate and ammonia levels using L-carnitine, sodium benzoate and sodium phenylacetate. His valproate and ammonia levels responded rapidly and neurological function normalised.

CONCLUSIONS. Hyperammonemia occurs in sodium valproate toxicity through inhibition of one of the urea cycle enzymes. Sodium benzoate and sodium phenylacetate are metabolically active compounds that can serve as an alternative route of excretion of waste nitrogen: by conjugating amino groups to create non-toxic molecules which are excreted in the urine, they are the mainstay of standard treatment for inherited disorders of the urea cycle [4]. It was postulated that these drugs could also reduce acquired hyperammonemia due to an acquired urea cycle defect secondary to severe drug toxicity. To our knowledge this is the first report of sodium benzoate and sodium phenylacetate used to treat potentially fatal valproate poisoning.

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0591

HUMAN ATRIAL NATRIURETIC PEPTIDE AND RENAL FUNCTION IN PATIENTS WITH ACUTE KIDNEY INJURY AFTER CARDIOTHORACIC SURGERY

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INTRODUCTION. Acute kidney injury (AKI) is a frequent disorder after cardiothoracic surgery and is associated with a higher risk of complication or death. Early recognition and treatment for AKI are very important to prevent progression to severe kidney injury. Human atrial natriuretic peptide (hANP) is a potent natriuretic, diuretic, and vasorelaxant substance. We have reported that the intraoperative and postoperative infusion of low-dose hANP preserved renal function in patients undergoing abdominal aortic aneurysm repair. Therefore, we hypothesized that hANP might have protective effects on renal function.

METHODS. We retrospectively investigated the effects of hANP on renal function in patients with AKI after cardiothoracic surgery between April 1, 1997 and March 31, 2008. Diagnostic criteria for AKI was based on the criteria of the Acute Kidney Injury Network. Cardiothoracic surgery included coronary artery bypass graft, valvular operations and thoracic aortic aneurysm repair. We divided into two groups; hANP group ($n = 115$) and non-hANP group ($n = 200$). Mean arterial pressure, cardiac index, urine volume, serum creatinine concentration, blood urea nitrogen concentration, doses of catecholamine, furosemide, and mannitol and rate of dialysis were compared between the two groups.

RESULTS. The rate of hANP infusion was 0.01–0.1 μg/kg/min and duration of infusion was 2–28 days. The dose of furosemide was significantly lower in the hANP group than in the non-hANP group. Urine volume was significantly increased and concentrations of serum creatinine and blood urea nitrogen were significantly lower in the hANP group than in the non-hANP group. In addition, the rate of dialysis was lower in the hANP group than in the non-hANP group. There were no significant differences in mean arterial pressure, cardiac index, and dose of catecholamine between the two groups.

CONCLUSION. Infusion of low-dose hANP is useful to preserve renal function in patients with AKI after cardiothoracic surgery.

Microcirculation and fluid responsiveness: 0592–0604

0592

BRACHIAL ARTERY PEAK VELOCITY VARIATION TO PREDICT FLUID RESPONSIVENESS IN MECHANICALLY VENTILATED PATIENTS

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INTRODUCTION. The degree of cyclic changes in left ventricular stroke volume due to intermittent positive-pressure ventilation have been demonstrated to accurately reflect preload-dependence in mechanically ventilated patients. Recently, Brennan et al. observed that respiratory variations in brachial artery peak velocity ($\Delta Vpeak_{brach}$), were tightly correlated with radial artery pulse pressure variations (ΔPP_{rad}), so $\Delta Vpeak_{brach}$ could be use as a non-invasive substitute in predicting fluid-responsiveness. However, the predictive value of this parameter was not tested performing a volume challenge and checking the effects in cardiac output.

OBJECTIVE. To confirm the predictive value of $\Delta Vpeak_{brach}$ as an indicator of fluid responsiveness in mechanically ventilated patients with acute circulatory failure.

PATIENTS AND METHODS. 35 mechanically ventilated patients in whom fluid loading was considered due to the presence of at least one sign of acute circulatory failure. Patients were classified as responders if stroke volume index (SVi) increased $\geq$15% after volume expansion (VE). Maximum and minimum values of $Vpeak_{brach}$ ($Vpeak_{max}$ and $Vpeak_{min}$, respectively), were determined over a single respiratory cycle. The respiratory variation in $Vpeak_{brach}$ was calculated as the difference between $Vpeak_{max}$ and $Vpeak_{min}$ divided by the mean of the two values and expressed as a percentage. ΔPP_{rad} and stroke volume variation measured with the FloTrac/Vigileo® system ($\Delta SV_{Vigileo}$), were also calculated.

RESULTS. 19 patients were considered as responders according to the SVi increase after VE. At baseline, $\Delta Vpeak_{brach}$, ΔPP_{rad} and $\Delta SV_{Vigileo}$ were significantly higher in responder than in nonresponder patients (16 vs. 7%; 20 vs. 5%; 16 vs. 8%; $P < 0.001$, respectively). SVi changes induced by VE was correlated with baseline values of $\Delta Vpeak_{brach}$, ΔPP_{rad} and $\Delta SV_{Vigileo}$ ($r = 0.73$, 0.86 and 0.67; $P < 0.001$, respectively). The VE-induced decreases in $\Delta Vpeak_{brach}$ and ΔPP_{rad} were also correlated with changes in SVi after VE ($r = -0.71$ and -0.72, $P < 0.0001$, respectively), but not $\Delta SV_{Vigileo}$. A $\Delta Vpeak_{brach}$ of 10% predicted fluid responsiveness with a sensitivity of 72% and a specificity of 94%, whereas a ΔPP_{rad} of 8% had a sensitivity of 94% and a specificity of 94%, and a $\Delta SV_{Vigileo}$ of 11% had a sensitivity of 78% and a specificity of 94%. The area under the ROC curve (AUC) was not significantly different between $\Delta Vpeak_{brach}$, ΔPP_{rad} and $\Delta SV_{Vigileo}$ (AUC ± standard error: 0.89 ± 0.06, 0.96 ± 0.03, 0.89 ± 0.06, respectively).

CONCLUSIONS. Respiratory variation in brachial artery peak velocity could be a feasible tool for predicting fluid responsiveness in patients with mechanical ventilatory support.

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0593

DOSE-DEPENDENT BENEFIT OF NITROGLYCERIN ON MICROCIRCULATORY PERFUSION IN PATIENTS WITH CARDIOGENIC SHOCK OR END-STAGE CHRONIC HEART FAILURE

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OBJECTIVES. We tested the hypothesis that nitroglycerin, a nitric oxide donor and potent venodilator, dose-dependently improves tissue perfusion in patients with cardiogenic shock or end-stage chronic heart failure.

METHODS. A dose-response study was performed in fifteen patients with cardiogenic shock ($n = 9$) or end-stage chronic heart failure ($n = 6$) admitted to Erasmus University Medical Center. We did hemodynamic measurements at baseline (T0), during increasing infusion rates of nitroglycerin (T1–T5; up to a maximum dose of 133 μg min^{-1}) and when nitroglycerin had been stopped (T6). As parameters of tissue perfusion, we measured central-peripheral temperature gradient (delta-T) and sublingual perfused capillary density (PCD). Capillaries were defined as micro-vessels with a diameter of <20 μm.

RESULTS. Nitroglycerin dose-dependently decreased mean arterial pressure ($p = 0.01$), cardiac filling pressures [central venous pressure (CVP): $p < 0.001$; pulmonary capillary wedge pressure: $p = 0.001$], and mixed-venous oxygen saturation ($p = 0.02$). Nitroglycerin decreased delta-T ($p < 0.001$; Fig. 1) and improved sublingual PCD ($p< 0.001$; Fig. 2). Macro-hemodynamic and microcirculatory responses to nitroglycerin infusion were consistent in patients with either cardiogenic shock or end-stage chronic heart failure. Analysis of pooled data showed a correlation between changes in CVP and changes in delta-T ($p = 0.02$) and between changes in CVP and changes in PCD ($p< 0.01$).

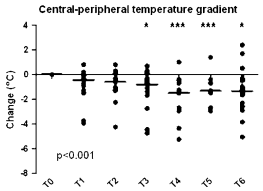

Figure 1

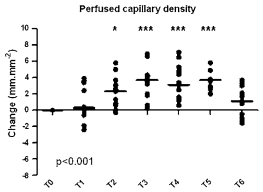

Figure 2

CONCLUSIONS. Nitroglycerin dose-dependently increases tissue perfusion. This increase was significantly correlated to the decrease in central venous pressure. Further studies should verify whether monitoring tissue perfusion could optimize current treatment strategies in patients with severe heart failure or cardiogenic shock.

0594

EFFECTS OF POSITIVE END-EXPIRATORY PRESSURE ON TISSUE O_2 SATURATION IN AN ANIMAL MODEL WITH AND WITHOUT HYPOXEMIA

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INTRODUCTION. High positive end-expiratory pressure (PEEP) levels during mechanical ventilation have been used to avoid lung collapse and impairment of arterial oxygen saturation. Application of PEEP also decreases venous return and cardiac output, causing secondary poor tissue perfusion. The direct relationship between PEEP and tissue O_2 saturation has not yet been studied.

OBJECTIVES. To investigate in an animal model the effects of acute decreases in global blood flow brought by incremental increases in PEEP on peripheral tissue oxygenation (StO_2) assessed by near infrared spectroscopy before and after induction of hypoxemia.

METHODS. We performed experiments in five female pigs. Animals were anesthetized and ventilated in a volume control mode. FIO_2 was set to 0.8. Measurements were done in the intact lung condition (model 1) and after induction of hypoxemia (model 2) by injection of oleic acid. PEEP was applied in increments of 5 cmH_2O each 10 min from baseline (0 cmH_2O) to 20 cmH_2O (model 1) or 25 (model 2) after which it was decreased in steps of 5 cmH_2O following the same protocol. Mean arterial pressure (MAP), central venous pressure (CVP), central oxygen saturation (SvO_2) and cardiac output (CO) were continued monitored. StO_2 was continuously measured on the leg using InSpectra Model 650 (Hutchinson Technology Inc.). Differences between groups were tested by Wilcoxon signed test. P values < 0.05 were considered statistically significant.

RESULTS. Hemodynamic and oxygenation variables in the different levels of PEEP stratified by lung condition are shown in the following Tables 1, 2.

TABLE 1 INTACT LUNG. A:P<0.05 VS. BASELINE

PEEP	0	10	15	20
HR	89	102	112	125
MAP	92	95	90	89
CVP	5	8	9	11[a]
CO	4.8	4.8	4.2	3.7
SaO_2	100	100	100	100
SvO_2	79	77	73	65[a]
StO_2	52	51	48	44[a]

TABLE 1 PULMONARY EDEMA. A:P<0.05 VS. BASELINE

PEEP	0	10	15	25
HR	151	141	139	174
MAP	96	99	99	76
CVP	5	7	8	11[a]
CO	5.5	5.6	4.7	3.4[a]
SaO_2	70	86	99	99[a]
SvO_2	43	54	62	58
StO_2	31	41[a]	39	36

Elevation of PEEP significantly increased CVP in both models. During manipulation of PEEP, significant changes of StO_2 and SvO_2 were also observed. After the normalization of SaO2 in the model 2, further increments in PEEP levels did not produce significant changes in StO_2.

CONCLUSION. Application of high PEEP impairs peripheral tissue oxygenation via its negative effect on macrohemodynamic variables in the intact lung condition. After induction of hypoxemia, the increment of SaO_2 following application of PEEP may outweigh the decline of CO, thereby resulting in higher StO_2.

0595

HEMODYNAMIC IMPACT OF RECRUITMENT MANEUVERS IN ARDS PATIENTS AFTER PRELOAD OPTIMIZATION BY PULMONARY ARTERY CATHETER OR VIGILEO CRITERIA

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INTRODUCTION. Recruitment maneuvers (RM) are being increasingly used during mechanical ventilation (MV) in ARDS pts. Although these maneuvers could add in evaluating potential lung recruitment or to set PEEP levels, they can also be hemodinamically deleterious. This effect could be attenuated by improving preload before the RM.

OBJECTIVES. Our aim was to assess the hemodynamic impact of an isolated RM in patients previously subjected to preload optimization under invasive (pulmonary artery catheter (PAC)) or minimally invasive (Vigileo, Edwards USA©) hemodynamic monitoring.

METHODS. The study was approved by our local IRB and informed consent was waived. Inclusion criteria included ARDS patients with MV <72 h, stable central hemodynamics and a PAC or Vigileo monitoring in place. Before the RM, patients with a PAC were given volume challenges until cardiac index (CI) increased by <10%. In patients with Vigileo conversely, volume challenges were administered only with a stroke volume variation (VVS) >10%. After this period, a RM was performed in all patients (ventilation for 3 min in pressure control mode at plateau pressure of 45 cm of water). We evaluated immediately before, during, after and 15 min thereafter, several hemodynamic and respiratory parameters, including CI. Secondarily, we compared hemodynamic performance in patients volume-loaded under PAC or Vigileo guidance. Results are expressed as mean ± SD. Statistical analysis included Fischer's exact test, and the Wilcoxon or the Mann–Whitney U tests.

RESULTS. We enrolled 12 pts, 7 with PAC and 5 with Vigileo. APACHE II, and $PaFiO_2$ were 17 ± 6 and 224 ± 70.2. Mean basal CI was 3.95 ± 1.0 L/min per m^2. PAC versus Vigileo monitored pts. required > volume to reach hemodynamic goal (321.4 ± 122 vs. 50 ± 11.8 mL; $p = 0.008$). During the RM, CI decreased 0.4 ± 0.5 L/min per m^2 ($p = 0.026$); without differences between groups. 83% maintained CI >3.0, and none decrease CI below 2.5 L/min per m^2.

CONCLUSIONS. Preload optimized ARDS patients tolerate recruitment maneuvers without clinically significant hemodynamic consequences, with a mean decrease in cardiac index of only 0.4 L/min m^2. Preload optimization guided by PAC or Vigileo are equivalent, but this later allows less volume infusion (Table 1)

TABLE 1 MAIN RESULTS

Variable	Before MR	During MR	p*
HR	96.6 ± 15	96.5 ± 15.6	0.953
MAP	79.6 ± 5.6	80.71 ± 1	0.593
CI	4.2 ± 1.1	3.8 ± 1.1	0.026
$ScvO_2$	73.7 ± 6.5	73.4 ± 6.8	0.594

0596

IS THERE ANY DIFFERENCE BETWEEN GENERAL ANESTHESIA ALONE OR ASSOCIATED WITH THORACIC EPIDURAL ANAESTHESIA ON THENAR STO_2 ALONG HYPERTHERMIA FOR INTRAPERITONEAL CHEMOTHERAPY?

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INTRODUCTION. Hyperthermic intraperitoneal chemotherapy (HIPEC), associated with cytoreductive surgery is the only therapy prolonging survival for patients with peritoneal carcinomatosis.

OBJECTIVE. To evaluate the impact of transient acute hyperthermia on systemic hemodynamic and micro-oxygenation of thenar eminence under general anaesthesia (GA) alone or associated with thoracic epidural anaesthesia (TEA).

MATERIAL AND METHODS. 15 patients, ASA1 or 2, 9F/6 M, 50.3 y.o. (33–66), with peritoneal carcinomatosis; GA alone ($n = 6$) or associated to TEA ($n = 9$, T8–T9, ropivacaïne 2 mg/ml + sufentanyl 0.5 mcg/ml) settled before induction. Monitoring: invasive blood pressure (BP, radial artery), BIS (30–40, Astect Medical System®), oesophageal temperature (Tyco Healthcare®), continuous central SvO_2 measurement (Edwards Lifesciences®), cardiac output (CO, Doppler TE, Doptek®). Muscle haemoglobin saturation measurements (StO_2, thenar eminence, non-blocking area) by NIRS (Hutchinson®) and during occlusion test (3 min, 300 mmHg). Blood flow monitored on forearm by laser-Doppler (LD, Transonic®). *Timing of measurements:* end of viscerolysis, beginning and end of chemohyperthermia, and finally at the end of the procedure. Statistics: nonparametric tests

RESULTS. Procedure duration: 11.1 h (8–14) with a large fluid loading (20 ml/kg per hour, range 9–35) with crystalloids (1/3 0.9% saline, 2/3 ringer lactate), comparable in both groups. The two groups did not differ for systemic hemodynamic. Hyperthermia induced a moderate tachycardia similar under GA or GA + TEA. BP decreased at the end of the procedure, with a stable CO. Oesophageal temperature increased with hyperthermia, more importantly in the GA group ($p = 0.03$). Baseline StO_2 was in normal range and stable in the two groups. The StO_2-reperfusion slope did not differ between GA and TEA and increase during hyperthermia. The more rapid was the drop of occlusion slope (rapid ischemia), the steeper was the reperfusion slope (vascular recruitment). The forearm skin blood flow (laser-Doppler) increased with hyperthermia so did the LD-reperfusion slope, with no difference in the two groups.

DISCUSSION. We have found no difference between GA or TEA + GA for the consequences of hyperthermia on systemic and tissue perfusion during hypothermic intraperitoneal chemotherapy. The benefit of one of two anaesthetic procedures remains to be demonstrated in postoperative period especially for inflammatory parameters.

KEYWORDS. HYPERTHERMIA, TISSUE SATURATION, EPIDURAL ANAESTHESIA

0597

EFFECTS OF LUNG RECRUITMENT MANEUVERS ON SPLANCHNIC MICROCIRCULATION DURING PORCINE ENDOTOXEMIA

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INTRODUCTION. Sepsis may impair gastrointestinal perfusion due to vasodilation and redistribution of blood flow. Microcirculatory perfusion deficits may be present despite intact systemic hemodynamics [1]. Lung recruitment maneuvers (RM), used to re-open atelectatic lung units and to improve oxygenation during mechanical ventilation [2] may result in hemodynamic impairment. We hypothesized that the adverse hemodynamic effects of RM may be potentiated during sepsis. This was tested in a model of porcine endotoxemia.

MATERIAL AND METHODS. Twelve anesthetized and paralyzed pigs underwent laparotomy and prolonged postoperative ventilation. The lungs were ventilated in volume-controlled mode with a tidal volume of 10 mL/kg and a PEEP of 5 cmH_2O. Systemic (pulmonary artery catheter), regional (Ultrasonic transit time flowmetry) and microcirculatory (Laser Doppler flowmetry) blood flows were monitored. After 6 h (=baseline), a recruitment maneuver was performed with sustained inflation of the lungs to an airway pressure of 30 cm H_2O for 10 s. Thereafter the pigs were randomly assigned to group C (control, $n = 6$) or group E (endotoxemia, $n = 6$). Endotoxemia was induced using a continuous infusion of lipopolysaccarides (LPS) over 12 h. The RM was then repeated in both groups.

RESULTS. Infusion of LPS provoked a hyperdynamic circulation and a significant increase in pulmonary arterial pressure in the animals of the endotoxin group. When performed during endotoxemia (group E), RM decreased aortic pulse pressure, a surrogate of cardiac stroke volume [3], from 37 ± 14 to 27 ± 13 mmHg ($P = 0.024$). The blood flows of renal artery, hepatic artery, celiac trunk, superior mesenteric artery, and portal vein dropped to 71 ± 21, 69 ± 20, 76 ± 16, 79 ± 18 and 81 ± 12%, respectively (% of baseline flows before RM; mean ± SD; $P < 0.05$ all, except hepatic artery [$P = 0.086$]). Microcirculatory blood flows of kidney cortex, kidney medulla, liver and jejunal mucosa in group E decreased to 65 ± 19, 77 ± 13, 66 ± 26 and 71 ± 12%, respectively (% of baseline flows before RM; mean ± SD; $P < 0.05$ all, except liver [$P = 0.081$]). The corresponding recovery times to at least 90% of baseline regional blood flow and microcirculatory blood flow were between 1 and 5 min. The decreases in regional perfusion and microcirculatory blood flow and the time to recovery of these flows did not differ from the controls ($P > 0.05$ all).

CONCLUSION. In this animal model of sepsis, endotoxemia did not aggravate the negative hemodynamic effects of a lung recruitment maneuver. The impairment of regional and microcirculatory abdominal blood flows is significant but transient in character. Thus, our data suggest that the hemodynamic effects of a RM are not aggravated in sepsis.

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0598

DYNAMIC INDICES BY PULSECOTM IN POST SURGICAL INTENSIVE CARE PATIENTS

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INTRODUCTION. Predicting fluid responsiveness in the perioperative period is important in order to haemodynamically optimise patients without overloading them [1].

OBJECTIVE. Studying the ability to predict fluid responsiveness of dynamic indices such as pulse pressure variation (PPV), stroke volume variation (SVV) and systolic pressure variation (SPV) as measured by PulseCOTM (LiDCOTMplus).

METHODS. Fully sedated and mechanically ventilated patients, with no spontaneous respiratory effort and no arrhythmias were admitted post-surgery to the General Intensive Care Unit and monitored with the LiDCOTMplus. Haemodynamic optimisation was started according to the unit protocol with the aim to maximise the stroke volume (SV) and then to reach an oxygen delivery index of 600 ml/min m^2. Fluid challenges consisted of 250 ml boluses of colloid (rate 50 ml/min). A SV increase of >15% was considered a positive response (fluid responder). PPV, SVV and SPV were recorded prior to fluid administration, together with static haemodynamic measurements such as mean arterial pressure (mAP), central venous pressure (CVP) and Heart Rate (HR). Receiving Operator Characteristic (ROC) analysis was performed to detect the sensitivity and specificity of the test.

RESULTS. 19 fully sedated and mechanically ventilated (tidal volume 8 ml/kg, PEEP 5 cmH_2O) post surgical patients were admitted to the General Intensive Care Unit during the study period. No patients had arrhythmias. The demographic characteristics showed: 12 males, 7 females, mean weight 75 kg (±17), mean height 1.7 m (±0.12), mean age 65 kg (±16). 27 fluid challenges were performed during the study period. 6 of the 19 (32%) patients were fluid responders on admission to the unit. ROC analysis did not show the areas under the curve to be statistically significant for CVP and HR. Areas under the ROC curves were 0.83 for PPV ($p < 0.05$), 0.84 for SVV ($p < 0.05$), 0.78 for SPV ($p < 0.05$) and 0.83 for mAP ($p < 0.05$). The best cutoff values (sensitivity and specificity) to predict fluid responsiveness were PPV 15% (83%, 82%), SVV 12% (83%, 85%), SPV 8% (83%, 78%) and mAP 78 mmHg (83%, 67%).

CONCLUSIONS. Dynamic indices measured by PulseCOTM (LiDCO) have a high sensitivity and specificity in predicting fluid responsiveness in fully sedated and mechanically ventilated patients. A cut off value for SVV of 12% is the most sensitive and specific indicator of fluid responsiveness.

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0599

PREDICTION OF FLUID RESPONSIVENESS IN SEPTIC PATIENTS WITH A LOW TIDAL VOLUME

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INTRODUCTION. Fluid responsiveness can be accurately predicted by the respiratory variation of arterial pulse pressure (PPV) in mechanically ventilated patients but it has been suggested that this prediction is poorer in case of low tidal volume (Vt). We attempted to confirm this hypothesis. We also tested whether two other tests of fluid responsiveness, the changes in pulse contour-derived cardiac index induced by passive leg raising (PLR) and by a 15-s tele-expiratory occlusion test (TEO) depend upon the Vt.

PATIENTS AND METHODS. We included 39 patients with septic shock (61 ± 12 years, 33 receiving norepinephrine, SAPS2 = 63 ± 23). In 19 (49%) patients with an acute respiratory distress syndrome the Vt was ≤7 mL/kg of predicted body weight (6.7 ± 0.4 mL/kg). We measured the response of cardiac index (pulse contour analysis, PiCCO device) to fluid administration (500 mL saline over 20 min). Before fluid administration, we recorded the PPV and the changes in cardiac index induced by PLR and TEO.

RESULTS. Considering the whole population, fluid administration increased cardiac index by more than 15% (50 ± 44%) in 22 "responders". For predicting fluid responsiveness, the area under the receiver operating characteristics (ROC) curves were 0.81 ± 0.07 (cut-off value = 8%, sensitivity = 59%, specificity = 94%) for PPV, 0.89 ± 0.05 (cut-off value = 9%, sensitivity = 91%, specificity = 88%) for PLR and 0.92 ± 0.05 (cut-off value = 8%, sensitivity = 59%, specificity = 94%) for TEO. When considering only the 20 patients ventilated with a Vt > 7 mL/kg of predicted body weight, the area under the ROC curves were 0.85 ± 0.08 (cut-off value = 10%, sensitivity = 92%, specificity = 89%) for PPV, 0.86 ± 0.08 (cut-off value = 9%, sensitivity = 91%, specificity = 79%) for PLR and 0.95 ± 0.05 (cut-off value = 6%, sensitivity = 73%, specificity = 100%) for TEO. When considering only the 19 patients ventilated with a Vt ≤ 7 mL/kg of predicted body weight, the area under the ROC curves were 0.77 ± 0.11 (cut-off value = 6%, sensitivity = 63%, specificity = 75%) for PPV, 0.91 ± 0.07 (cut-off value = 9%, sensitivity = 91%, specificity = 100%) for PLR and 0.91 ± 0.07 (cut-off value = 5%, sensitivity = 91%, specificity = 100%) for TEO. In these patients, when considering an 8% cut-off for PPV, seven were falsely classified as nonresponders by PPV but all were well classified by PLR and TEO.

CONCLUSION. When tidal volume is ≤7 mL/kg of predicted body weight, PPV looses part of its accuracy for predicting fluid responsiveness. However, the PLR and TEO tests are fully accurate alternatives in such cases.

0600

INFLUENCE OF TIDAL VOLUME ON RESPIRATION-INDUCED CHANGES IN PULSE PRESSURE IN VENTILATED PIGS WITH ARDS SUBJECTED TO HYPOVOLEMIA

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INTRODUCTION. Sensitivity and specificity of respiratory change in pulse pressure (ΔPP) to predict preload dependency has been questioned at small tidal volumes (V_T) in critically ill patients suffering from ARDS.

OBJECTIVE. We studied ΔPP, in pigs with ARDS during reversible hemorrhagic shock.

METHODS. Prospective, observational study in an animal laboratory Investigation Unit. Sixteen deeply sedated mechanically ventilated pigs were ventilated successively with V_T of 10 ml kg^{-1}/respiratory rate (RR) of 15 min^{-1} and V_T of 6 ml kg^{-1}/RR of 15 or 25 min^{-1}. ARDS was produced by lung lavage in 8 pigs (ARDS group). Severe hemorrhagic shock was induced by 40% of total blood volume removed followed by restoration. A two-way analysis of variance (ANOVA) for repeated measures was used to analyze the combined effects of the successive interventions (hemodynamic conditions, ventilation modes) as well as to compare the two treatment groups (ARDS vs. Controls) using Statistica® software package. Group data are presented as mean ± SE values.

RESULTS. Following bleeding, in the Control group ventilated with a V_T of 10 ml/kg, ΔPP increased from 8.3 ± 0.9 to 19.5 ± 2.9%; $p < 0.001$. In ARDS group, this index was also significantly increased, though to a lesser extent than in the Control group (from 4.8 ± 0.6 to 12.7 ± 3.1%; $p < 0.05$). In Control lungs, reduction in V_T from 10 to 6 ml/kg decreased ΔPP changes by >50% although it remained statistically valid indicator of hypovolemia whatever RR value ($p < 0.05$). In contrast, in ARDS group, ΔPP was unreliable marker of hypovolemia at low V_T ventilation ($p > 0.05$).

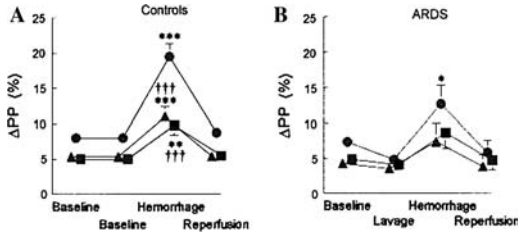

Figure 1

CONCLUSIONS. The present study suggests that in pigs with ARDS ventilated with small V_T, ΔPP is not a sensitive indicator of severe hypovolemia.

Figure legends: O: V_T 10 ml kg^{-1} RR of 15 bpm; Δ: V_T 6 ml kg^{-1} RR of 15 bpm; ∼: V_T of 6 ml kg^{-1} RR bpm of 25.

0601

THE EFFECT OF AORTIC CROSS CLAMP ON INTESTINAL AND SUBLINGUAL MICROCIRCULATION: THE FIRST IN VIVO IMAGING STUDY OF GUT

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INTRODUCTION. Gut ischemia is a recognised complication of aortic cross clamping in patients undergoing open abdominal aortic aneurysm (AAA) repair, with an incidence approximately 2% after elective surgery [1]. In addition to direct ischaemia, ischaemia-reperfusion of the distal vascular beds also contributes to alterations in the microcirculation. The extent to which ischemia-reperfusion secondary to infra-renal aortic cross clamping alters the microcirculation in the somatic and visceral beds intra-operatively is currently unknown.

OBJECTIVES. To characterise the microcirculatory changes in somatic (sublingual) and visceral (intestinal) vascular beds in patients undergoing AAA repair.

METHODS. Patients undergoing elective AAA repair were recruited and Side stream Dark Field imaging (SDF, Microscan^{TM}, Netherlands) was used to estimate microcirculation. To determine the effect of reperfusion, sublingual and intestinal (sigmoid colon serosa) microcirculation was estimated before aortic cross clamping and after the release of the clamp. All measurements were taken and analyzed in accordance with the consensus document [2]. Simultaneously hemodynamic variables were recorded using Finapres^{TM}, a well validated finger plethysmograph technique. Paired *t*-test was used for statistical analysis using SPSS statistical software.

RESULTS. To date, four male and one female have been recruited. Percentage of perfused vessels (PPV), total vessel density (TVD), capillary vessel density (CVD), perfused vessel density (PVD) and microvascular flow index (MFI) of small and large vessels of all images are presented in Table 1. All values are presented as mean with standard deviation in parenthesis.

TABLE 1 INTESTINAL AND SUBLINGUAL MICROCIRCULATORY VARIABL

	GUT Before Clamp	Microcirculation Reperfusion	*p* Value (<0.05 — significant)	Sublingual Before Clamp	Microcirculation Reperfusion	*p* Value
PPV (vessels/mm2)	94% (6.2%)	85% (6.9%)	0.9	99% (1.7%)	93% (5.4%)	0.09
TVD (vessels/mm2)	9.66 (3.5)	8.61 (1.6)	0.5	12.38 (2.0)	10.75 (1.3)	0.3
CVD (vessels/mm2)	7.54 (3.1)	7.37 (1.8)	0.9	10.10 (1.6)	8.64 (1.4)	0.3
PVD (vessels/mm2)	9.11 (3.9)	7.39 (1.4)	0.4	12.20 (2.1	10.07 (1.6)	0.2
MFI (Small Vessels)	2.83 (0.3)	2.71 (0.3)	0.6	3.0 (0)	3.0 (0)	0.1
MFI (Large vessels)	2.65 (0.4)	2.15 (1.3)	0.5	3.0 90)	2.87 (0.2)	0.2
Mean Arterial Pressure	82 (11)	79 (15)	0.7			
Cardiac output	3.9 (1.4)	4.7 (0.9)	0.5			

CONCLUSION. This first human in vivo study demonstrates that it is feasible to use the SDF technology to quantify intestinal serosal microcirculation. Ischaemia-reperfusion related to aortic cross clamping is not associated with significant microcirculatory abnormalities in both sublingual and intestinal vascular beds. There was a statistically nonsignificant reduction in most of the measurable microcirculatory indices at reperfusion stage compared to the baseline. This may be due to a relatively small sample size or it is possible that the major determinants of microcirculation are mean arterial pressure and cardiac output, both of which remained unaltered between the two phases of the study.

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0602

ANAESTHESIA INDUCED CHANGES IN TISSUE SATURATION IN RESPONSE TO VASCULAR OCCLUSION TEST

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INTRODUCTION. General anaesthesia is associated with changes in the microcirculation and tissue oxygen uptake

OBJECTIVES. This study looks into muscle tissue saturation using near infrared spectroscopy (NIRS), both in healthy volunteers and in patients under inhalational general anaesthesia.

METHODS. This was a prospective observational study performed on awake subjects and anaesthetised patients. A standardised 3 min vascular occlusion test (VOT) was performed by rapid inflation of a forearm cuff to 50 mmHg above systolic pressure. Muscle tissue oxygen saturation was measured using a Hutchinson Technology^{TM} InSpectra^{TM} StO_2 tissue oxygenation monitor, with a 15 mm probe applied to the right hand thenar eminence.

This test was carried out on awake healthy volunteers with no concurrent illnesses under reproducible conditions. In the anaesthetised group a VOT was performed 10 minutes after a standardised intravenous anaesthetic induction, whilst general anaesthesia was maintained with oxygen, air and isoflurane. Data were described as median (Interquartile range) and Mann–Whitney test was performed to assess statistical significance.

RESULTS. A total of 25 healthy volunteers and 22 anaesthetised patients were enrolled. There were statistically significant differences between the two groups as illustrated in Table 1. Baseline StO_2 was significantly higher in the anaesthetised group [84.00 (7.50) vs. 79.00 (7.00)] %, $p = 0.004$. After cuff inflation the down slope StO_2 was lower in the anaesthetised group [−8.15 (3.22) vs. −10.92 (3.13)] %/minute, $p = 0.001$. The subsequent upslope, on release of the cuff pressure, was also lower in the anaesthetised group [147.75 (86.87) vs. 218.57 (71.04)] %/minute, $p = 0.009$. The minimum StO_2 at 3 min ischemia, was significantly higher in the anaesthetised group [59.50 (13.25) vs. 45.00 (12.5)] %, $p = 0.001$ in addition to the area within the occlusion curve [35.45 (15.77) vs. 52.2 (11.85)] %.min, $p < 0.001$. Maximum StO_2 was also higher in the anaesthetised group [96.50 (3.25) vs. 94.00 (3.5)] %, $p = 0.004$. The difference between baseline StO_2 and minimum StO_2 was found to be lower in the anaesthetised group [24 (9) vs. 33 (9)] %, $p < 0.001$.

TABLE 1 VASCULAR OCCLUSION TEST FINDINGS

	Awake healthy volunteers ($n = 25$)	Anaesthetised patients ($n = 23$)	*p*
Baseline StO_2 [median (IQR)] (%)	79 (7)	84 (7.5)	0.004
Down slope StO_2 [median (IQR)], %/min	−10.92 (3.13)	−8.15 (3.22)	0.001
Up slope StO_2 (median (IQR)), %/min	218.57 (86.86)	147.75 (71.04)	0.009
Minimum StO_2 [median (IQR)] (%)	45 (12.5)	59.5 (13.25)	0.001
Maximum StO_2 [median (IQR)] (%)	94 (3.5)	96.5 (3.255)	0.004
Area within occlusion curve [median (IQR)], % min	−52.2 (11.85)	−35.45 (15.77)	<0.001
Area under the reperfusion curve [median (IQR)], %.min	18.5 (6.6)	24.75 (16.05)	NS
Baseline StO_2-minimum StO_2 [median (IQR)], %	33 (9)	24 (9)	<0.001
Maximum StO_2-baseline StO_2 [median (IQR)], %	15 (4.5)	11.5 (7.5)	NS

CONCLUSION. This study shows differences in tissue oxygen saturation during a VOT between awake and anaesthetised patients. This maybe due to anaesthetic related micro circulatory effects or changes in cellular uptake of oxygen or both.

0603

PREDICTING VOLUME RESPONSIVENESS BY FUNCTIONAL HEMODYNAMIC PARAMETERS IN THE STATE OF EXPERIMENTAL CARDIAC INSUFFICIENCY

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BACKGROUND. Predicting the response of left ventricular stroke volume-to-volume administration remains a controversially discussed clinical problem, especially in patients with acutely compromised cardiac function. Therefore, we investigated the predictive value of recently implemented functional hemodynamic parameters suggested for the use in critically ill patients to predict volume responsiveness. These include pulse contour-derived stroke volume- and pulse pressure variation (SVV, PPV), global end-diastolic—and right-ventricular end-diastolic volume (GEDV, RVEDV) derived by thermodilution as well as the parameter RSVT-Angle, derived by the recently reported respiratory systolic variation test (RSVT) in an experimental model of cardiac insufficiency.

METHODS. 13 anesthestized pigs BW 30.8 kg (±3.7) were investigated. After baseline measurements cardiac insufficiency was induced by infusion of verapamil until maximum left ventricular peak pressure (dPmx) reached 50% of baseline values. Then, 20 ml/kg BW of blood were withdrawn to establish hypovolemia. Consecutively, fluid loading was performed in each animal in four steps of 7 ml/kg BW each using the shed blood and hetastarch 6% 130 KD. The response to a fluid loading step was considered as positive, if cardiac output increased more than 10%. Receiver operating characteristic curves were plotted for PPV, SVV, RSVT-Angle, GEDV and RVEDV. In addition we included measurement of RAP. The RSVT performs an automated and standardized ventilation maneuver (three consecutive mechanical breaths with increasing airway pressures) to detect volume responsiveness in mechanical ventilated subjects.

RESULTS. With volume loading MAP increased from 38 mmHg (±8) to 69 mmHg (±10), HR from 78 (±9) to 80 (±9), CO from 2.4 l/min (±0.5) to 3.1 l/min (±0.6), GEDV from 375 ml (±63) to 452 ml (±77), RVEDV from 114 ml (±23) to 141 ml (±25) and RAP from 7.5 mmHg (±4.9) to 14.8 mmHg (±7.9). SVV decreased from 12.0% (±3.8) to 6.1% (±1.7), PPV from 14.1% (±4.3) to 6.2% (±2.2) and RSVT Angle decreased from 20.8 (±3.3) to 6.5 (±3.5). ROC analysis of the investigated parameters is shown below.

CONCLUSION. The recently introduced parameter RSVT-Angle and previously clinically implemented functional hemodynamic parameters are superior to static indicators of cardiac preload. These data of fluid responsiveness support the current concept of guiding volume therapy in patients with compromised cardiac function (Table 1)

TABLE 1

Test Variables	PPV (%)	SVV (%)	RSVT-Angle	GEDV	RVEDV	RAP
ROC curve area	0.84	0.82	0.88	0.77	0.66	0.78
Standard error	0.07	0.06	0.05	0.08	0.08	0.08
95% Confidence interval	0.71–0.97	0.70–0.94	0.77–0.98	0.62–0.92	0.50–0.82	0.63–0.93

0604

TISSUE OXYGEN SATURATION (STO_2) IN PATIENTS UNDERGOING MAJOR BOWEL SURGERY PREDICTS POST OPERATIVE COMPLICATIONS

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INTRODUCTION. Dynamic changes in tissue oxygen saturation (StO_2) in response to a vascular occlusion test (VOT) were shown to predict prognosis in patients with sever sepsis. It is unknown how these changes relate to surgical outcome.

OBJECTIVE. Assess the value of dynamic StO_2 changes in response to a VOT in identifying patients at risk of developing postoperative complications following major bowel surgery.

METHODS. A VOT was performed 10 min after a standardised intravenous anaesthetic induction, whilst general anaesthesia was maintained with oxygen, air and isoflurane. The test was performed by the rapid inflation of a pneumatic cuff placed above the elbow for 3 min. The pressure used to achieve vascular occlusion was 50 mmHg above patient's systolic. Muscle tissue oxygen saturation was measured using a Hutchinson Technology^{TM} InSpectra^{TM} 650 StO_2 tissue oxygenation monitor, with a 15 mm probe applied to the right hand thenar eminence. Patients were divided to two groups based on whether they developed postoperative complication or not. Complications included were: cardiovascular, respiratory, infective and major gastrointestinal complications. Data were described and analysed as non-parametric.

RESULTS. A total of 20 patients were enrolled. Table 1 illustrates the differences in the VOT derived StO_2 variables expressed in medians (interquartile range) along with statistical significance. Analysis of the receiver operating characteristics, for having an uncomplicated post operative course, showed that the maximum and minimum StO_2 values attained during VOT had an area under the curve of 0.85 ($p = 0.008$). Proposed cut-off values to determine patients with no postoperative complications are: minimum StO_2 of 59% (sensitivity and specificity of 80 and 70%, respectively) and a maximum StO_2 value of 97% (sensitivity and specificity of 80 and 70%, respectively).

TABLE 1 STO_2 CHARECTERSTICS OF STUDY PTS

	No complications	Complications	*p*
Variables			
Down slope StO_2%/min	−7.96 (1.93)	−8.93 (4.07)	0.257
Baseline StO_2%	87 (5)	82.5 (15)	0.016
Upslope StO_2%/min	144 (77.2)	197.14 (76.71)	0.226
Minimum StO_2%	62.5 (6)	55 (26)	0.0008
StO_2 area within occlusion curve %.min	35.45 (11.8)	46.25 (14)	0.257
StO_2 area under the reperfusion curve %.min	18.45 (18.9)	28.25 (14)	0.212
Maximum StO_2%	98 (2)	95 (5)	0.007

CONCLUSION. Dynamic StO_2 changes in response to a standardised vascular occlusion test show promise in predicting patients post operative course following major bowel surgery.

Heart failure: 0605–0615

0605

HEMODYNAMIC VARIABLES AND MORTALITY IN CARDIOGENIC SHOCK

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INTRODUCTION. Catecholamines are commonly used inotropes in cardiogenic shock [1]. There are hardly any beneficial effects of catecholamines on the heart itself [2]. Identification of hemodynamic variables and levels critical for survival could reduce catecholamine exposition and adverse effects in cardiogenic shock.

OBJECTIVES. To evaluate the association between hemodynamic variables and mortality, and to identify critical levels of hemodynamic variables to predict death in cardiogenic shock.

METHODS. In this retrospective study, medical records from 03/2005 to 06/2008 were reviewed for patients admitted to the intensive care unit (ICU) because of cardiogenic shock. All variables were extracted from the institutional patient data management system database which stores hemodynamic variables as median values over 2 min. For each hemodynamic variable, the hourly variable time integral during the first 24 h after ICU admission was calculated. If hemodynamic variables revealed a significant association with outcome, the hourly variable time integral of drops below clinically relevant threshold levels was computed. Demographic and clinical data and 28-day mortality were collected in all patients. Binary logistic regression models adjusted for age, admission year, catecholamine doses and SAPS II (excl. systolic arterial blood pressure and heart rate) as well as ROC analyses were calculated to test associations between single hemodynamic variables, threshold levels and 28-day mortality.

RESULTS. Hundred-nineteen patients were included into the analysis. 28-day mortality was 29.4%. The hourly cardiac index (CI) ($p = 0.01$) and cardiac power index (CPI) ($p = 0.03$) time integrals were the only hemodynamic variables that were significantly associated with mortality. The hourly time integral of CI drops below 3, 2.75 (both $p = 0.02$) and 2.5 ($p = 0.03$) L/min per m^2 was significantly associated with death but not that of CI drops below 2 L/min per m^2 or lower values (all $p > 0.05$). The hourly time integral of CPI drops below 0.5–0.8 W/m^2 (all $p = 0.04$) was significantly associated with mortality but not that of CPI drops below 0.4 W/m^2 or lower values (all $p > 0.05$).

CONCLUSIONS. During the first 24 h after ICU admission, CI and CPI seem to be independently associated with 28-day mortality in cardiogenic shock. A CI $\geq$ 2.5 L/min per $m^2$and a CPI $\geq$ 0.5 W/m^2 appear to represent critical levels for survival. Randomized controlled trials are required to evaluate whether targeting these levels as early resuscitation endpoints can improve survival in cardiogenic shock.

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0606

ACTIVATED PROTEIN C LEVELS IN PATIENTS WITH CARDIOGENIC SHOCK

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PURPOSE. In patients (pts) with severe sepsis low levels of activated protein C (APC) are associated with high morbidity and mortality. Because inflammation plays an important role in the development and outcome of cardiogenic shock (CS), we investigated whether pts with CS have also decreased circulating levels of APC and if these were associated with increased mortality.

METHODS. We measured serum APC levels in pts with CS following acute myocardial infarction (MI) and in a control group consisting of pts with uncomplicated MI at day 0, 1, 2, 3, 5, and 7 after onset of shock/MI. Data were correlated to vasopressor-(VP) need, organ failure and 28 day mortality.

RESULTS. In our study 30 pts with CS fullfilled the inclusion criteria, 6 pts were in the control group. In 83% of the CS pts ($n = 25$) an IABP was installed, 73% ($n = 22$) had to be mechanically ventilated. On day 0 after onset of shock the mean dose of dobutamin was 5.4 $\pm$ 4.6 µg/kg per minute and the mean vasopressor dose 0.49 $\pm$ 0.48 µg/kg per minute. Renal failure was observed in 37% ($n = 11$), and 50% ($n = 15$) had renal dysfunction; the total SOFA score on admission was 8.8 $\pm$ 3.0. The ICU and the 28 day-survival were 50% and the 7 day-survival 73%.

In pts with CS APC levels at baseline were significantly lower than in the control group (85 $\pm$ 27% vs. 103 $\pm$ 12%). We noted a decline in APC levels from admission to day 3 (72 $\pm$ 38% vs. 124 $\pm$ 10%, $p < 0.001$). 7 pts with CS died within 72 h. On day 3 non-survivors of CS did exhibit significantly lower APC levels than survivors (48 $\pm$ 28% vs. 85 $\pm$ 37%, $p = 0.03$). PC levels correlated significantly with the SOFA score from day 0 to day 3. There was no significant correlation with VP-need.

CONCLUSION. Pts with CS show a decline in APC levels. During the course of disease this decrease is more severe in non-survivors than in survivors and correlates with organ failure.

0607

REVERSIBLE MYOCARDIAL DYSFUNCTION: A COMMON UNRECOGNIZED PHENOMENON IN PATIENTS WITH SHOCK?

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INTRODUCTION. Reversible myocardial dysfunction (RMD) is a common phenomenon in acute and subacute coronary syndromes as stunning or hibernating myocardium. However, RMD can occur in critical photology of noncoronary origin related to stress, neurologic disease, postresucitation or sepsis. This phenomenon is called apical ballooning syndrome, tako-tsubo syndrome or reversible myocardial disfunction.

METHODOLOGY AND RESULTS. Over a six moths period (between June 2008 and December 2008) we admitted 293 patients in the intensive care unit. We made ecocardiography to 44 patients with shock and vasopressor therapy in the first 48 h of admission. 6 patients (13%) had echocardiography findings suggestive of RMD. Any patient has no history of heart disease, although 80% presents coronary risk factors, mainly smoking. Reasons for admission in ICU were: septic shock (3), sepsis (1), acute respiratory failure (1) and heart attack (1). The median age was 45 years (range 25–66) and 2 were women (33%). All the cases present a markedly reduced left ventricular ejection fraction (median 34.1 $\pm$ 6.9%) by Simpson's method without ventricular dilatation. Segmental contractility disturbances were observed in all patients, with the typical "apical ballooning" imaging in 65%. Troponin I level increase in all patients (median 14, range 3.46–25.42). ECG changes included: ST elevation (3); ST depression (1) and T changes (2). Acute hypoxemia was the most prevalent factor in the first 48 h. Left ventricular ejection fraction showed a progressive improvement in the first days (median 102 h, range 48–192).

CONCLUSION. Reversible myocardial disfunction is frequent in critically ill patients with hemodynamic impairment. Is a reversible phenomenon with typical echocardiography and electrocardiography findings with troponin I rising. The optimal management is a conservative therapy.

0608

HEMODYNAMIC PARAMETERS AND SHOCK TREATMENT AS DETERMINANT OF THE CORONARY PERFUSION PRESSURE (CPP) IN THE CRITICALLY ILL PATIENT

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INTRODUCTION. The perfusion of the coronary artery to the left ventricle occurs primarily during diastole. So there must be adequate diastolic pressure in the aortic root of both coronary arteries to be perfused. The CPP should be maintained above 50 mmHg. Below this critical value. Maintaining an adequate coronary perfusion should be a primary goal in resuscitation of any patient in shock. The coronary perfusion pressure (CPP) is calculated as the change in pressure through the coronary artery for the maximum myocardial flow (diastole). CPP = PAD − PAOP.

AIM. To Determinate the correlation between hemodynamic parameters such as CVP, CI, PAOP and SvO_2 and the treatment of shock on the CPP in the critically ill patients.

METHODS. A retrospective correlation study. We included all patients in a 6 month period with Swan Ganz (SG) catheter. Were exclude those who have not been given any of the variables for the calculating of CPP, with the data from the SG the CPP was calculated. The statistical correlation of variables with CPP was assessed with a bivariate correlation (Pearson Test), and ROC curve for discrimination of the test. A p value of less than 0.05 was considered to be statistically significant.

RESULTS. We studied 28 patients, 10 (64%) male patients and 18 (36%) women, the mean APACHE II score was 19.6 $\pm$ 7.5; in the admission the mean CPP was 42.2 $\pm$ 10.8 mmHg, and had a negative correlation con PAOP ($p < 0.001$) and CVP ($p = 0.001$), regarding mortality it had a negative correlation with the CPP at admission ($P = 0.022$) in a ROC curve analysis the cutoff value for CPP for mortality was 42 mmHg with a sensibility of 100% and specifity of 58% ($p = 0.026$ AUC 0.854). Also to the 24 h, the CVP and PAOP had a positive correlation with mortality. ($p = 0.016$ and 0.026). To the 24 h, the CPP had a positive correlation with PAOP ($p = 0.015$) but no with the mortality. There was negative correlation between CPP and the use of inotropics and vasoactives but without significance.

CONCLUSION. It's possible to estimate the CPP as a determinant of Reanimation as the PAOP, SVO_2, and CVP. In the same way, we can assess the impact of therapy in this setting, We expect that a low value of CPP could guide the use of inotropic or vasoactives to necessary values to try to keep an adequate perfusion, this may also determine an index of the efficacy and/or impact of treatment on the management of critical care patient, However, although these data are not conclusive and it could be the opportunity to study it in a deep way.

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0609

LEVOSIMENDAN AS SPARING EFFECT USING INOTROPE THERAPY

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INTRODUCTION. Acute Heart Failure is the main leading cause of complications in cardiac surgery. The patients with Low Cardiac Output usually have to be treated with high doses of catecholamines. However, the catecholamines have side-effects, which could affect on postoperative survival rate. The process of apoptosis, initialized by catecholamines could seriously compromise the myocardial function, therefore the medicine dose should be optimized. The therapy with Levosimendan has myocardium sparing effect co signify high-dose application of catecholamines. We studied the impact of Levosimendan on hemodynamic characteristics, and the necessity of catecholamine support and the survival rate of patients in this group.

METHODS. In this study participated 16 centers of cardiac surgery and were included 180 patients in the age of 40–85 years which underwent heart surgery. The medium Euroscore was 22.3, the medium CI 1.92, medium rate of LVEF was 26.97%. The Levosimendan infusion lasted 24 h with the estimation of cardiac activity data at the beginning of therapy, in 12 and in 24 h.

RESULTS. The medium dose of inotropes in the group of patients treated with Levosimendan was 0.042 mcg/kg/min. (DS 0.035, mediana 0.045 mcg/kg per minute) in the group without treatment with Levosimendan the medium dose of inotrops was 0.063 mcg/kg per minute (DS0.02, mediana 0.052 mcg/kg per minute). In the group of patients with Euroscore rate more than 20, the mortality was significantly lower than predicted (19.5 vs. 40.14%, test ANOVA p 0.44).

CONCLUSIONS. Levosimendan is a new cardiotonic drug which helps to decrease the risk of many undesirable effects of catecholamines and allows to get advantages in the treatment of patients with Low Cardiac Output syndrome.

0610

EFFECT OF PROPOFOL, MIDAZOLAM AND PENTOBARBITAL ON LEFT VENTRICULAR FUNCTION IN MALE WISTAR RATS DURING NON-INVASIVE HEART STUDIES

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INTRODUCTION. Transthoracic echocardiography (TTE) and pinhole gated SPECT are essential tools for serial non-invasive evaluation of cardiac structure and function, in particular of left ventricular volume. The choice of anaesthetic used for immobilization of the animal is of great importance since anaesthetic agents have different effects on haemodynamic and functional cardiac parameters. The dose and the type of anaesthetic may influence heart rate (beats per minute) and left ventricular (LV) function.

METHODS. Two different studies were performed using pinhole gated SPECT and TTE in male Wistar rats.

For the TTE study 24 rats were anaesthetized. A linear probe was used for assessing M-mode images and LV volumes (ml) were calculated using an ellipsoid model 10 min after administration of anaesthesia. Pentobarbital ($n = 8$; 50 mg/kg) IP, Propofol ($n = 8$; 200 mg/kg) IP and Midazolam ($n = 8$; 70 mg/kg) IP.

For the pinhole gated SPECT study 12 rats were scanned 2 times with 1 week interval. Once under Pentobarbital (60 mg/kg IP) anesthesia for the control study and a second time using the same anesthetics than the TTE study. Pinhole gated SPECT was performed 1 h after intravenous injection of 330 MBq ^{99m}Tc-MIBI. Parameters of cardiac function were derived using Quantitative gated SPECT.

STATISTICS. Data are expressed as mean ± SD. Differences in continuous variables were calculated using a Student's unpaired t test. P values were calculated two-tailed and differences were considered as significant if $P < 0.05$.

RESULTS. Significant lower heart rates were observed in the Propofol (287 ± 23 bpm) and the Midazolam (305 ± 17 bpm) group compared Pentobarbital in the TTE study but not in the SPECT study. Although significant changes in EDV and ESV for Midazolam and propofol resulted in better EF, CO decreased compared to Pentobarbital in both studies. Both studies demonstrate that Midazolam seems to have a positive inotropic effect on the left ventricular function (EF 85% in the SPECT study and 91% in the TTE study).

CONCLUSION. It was shown that cardiac function altered dramatically depending on the anesthetic used. The effect of the anesthetics must be taken into account when investigating cardiac function and volumes in small animals. Both studies demonstrate that Midazolam seems to have a positive inotropic effect on the left ventricular function

0611

LOCAL THROMBOLYSIS IMPROVES RIGHT VENTRICULAR DYSFUNCTION IN PULMONARY EMBOLISM

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OBJECTIVE. The role of thrombolysis in the management of pulmonary embolism (PE) with right ventricular (RV) dysfunction and hemodynamic stability is controversial. Our aim was to assess the value of local thrombolysis in the pulmonary artery associated with conventional treatment, in a group of these patients, in order to reduce the chance of developing future pulmonary hypertension.

METHODS. From January 2008 till March 2009, all patients with the following criteria were included: (1) PE confirmed with helicoidal CT scan; (2) RV dysfunction assessed by at least one of the following echocardiographic (ECO) findings: (a) subjective alteration of RV contractility; (b) RV diameter in the apical four chamber view >40 mm; (c) tricuspid annular plane systolic excursion (TAPSE) <15 mm; (d) tricuspid regurgitation (TR) with systolic pulmonary artery pressure (SPAP) >30 mmHg; (3) hemodynamic stability (systolic arterial pressure >90 mmHg). All underwent angiography and pulmonary artery catheterization with measurement of pulmonary artery pressures (PAP) after diagnosis. Local thrombolysis with urokinase (UK) (100.000–200.000 UI bolus and infusion of 100.000 UI/h) or alteplase (rtPA) (10 mg bolus and infusion of 40 mg) was performed, combined with infusion of unfractioned heparin to achieve APTT levels of 1.5–2 times control values. Control angiography was performed after 48 h of infusion.

RESULTS. Ten patients fulfilled these criteria. Seven were males. Mean age was 55.7 ± 20 years. 70% had risk factors for PE (40% had undergone a prolonged immobilization). Presenting symptoms were dyspnoea (80%) or syncope (30%). The initial systolic arterial pressure was 124.1 ± 20.7 mmHg. All patients had thrombus occupying the main and segmentary pulmonary arteries in the CT. In the ECO: 25% had severe RV dysfunction, 50% moderate and 25% normal function. Mean RV diameter was 46.5 ± 3.6 mm; TAPSE ($n = 7$) was 14.8 ± 4.2 mm; 25% had moderate TR, 25% mild and 50% had a normal function of the tricuspid valve. Mean PAP was 35.4 ± 12.2 mmHg. Nine patients were treated with UK, with a mean duration of thrombolytic infusion of 45.5 h (range 12 - 60 h). One received rtPA in a 4 h infusion. Improvement in the control angiography was found in 8/10 patients and in two of them there was complete resolution of PE. The mean PAP was lowered to 30.7 ± 11.7 mmHg. Follow up ECO (first week) showed normal RV contraction in 80% of the patients, and the other 20% had only a mild dysfunction. The RV diameter was reduced to 35.5 ± 8 mm; and the TAPSE ($n = 9$) increased to 22.6 ± 3.3 mm.

Complications: No severe complications were found. However, 40% had hematomas at puncture site, and although platelets count and fibrinogen remained above 85.000 cel/mm^3 and 100 mg/dL, respectively, in two patients treatment could not be completed due to hematuria and sever acute hepatic dysfunction.

CONCLUSIONS. Local pulmonary artery thrombolysis in our patients was effective in relieving RV strain.

0612

SHORT AND LONG TERM EFFECTS OF THROMBOLYSIS ON THE RIGHT VENTRICLE (RV) DYSFUNCTION DURING ACUTE PULMONARY EMBOLISM IN HEMODYNAMIC STABLE PATIENTS

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INTRODUCTION. The RV dysfunction during acute pulmonary embolism (APE) seems to be associated to increased mortality. Nevertheless, thrombolytic therapy in this group of patients with cor pulmonale remains controversial and not well investigated. Therefore, we aimed in this study to examine the effects of thrombolytic therapy in hemodynamically stable patients, with APE and a core pulmonale.

PATIENTS AND METHODS. Patients admitted to our intensive care unit with a proven APE (by angio CT scan) and presenting a core pulmonale were enrolled prospectively within a period of 11 months (November 2007 to October 2008).We administered thrombolytic therapy to all the patients and we recorded the following echocardiographic parameters : right to left ventricle surface ratio (RVs/LVs), the left ventricular ejection fraction (LVEF), the velocity–time integral (VTI) of the aortic flow, the systolic pulmonary artery pressure (sPAP), tricuspid annular plane systolic excursion (TAPSE) and Peak systolic motion velocity (Sa) determined by the tissue Doppler of the tricuspid annulus and the presence or not of paradoxical motion of the interventicular septum. The echocardiographic examination was performed before and 24 h after thrombolytic therapy. In addition, in a subgroup of patients echocardiography was realised between one and 6 months of follow up.

RESULTS. We have enrolled 14 patients, among them 7 patients with known chronic respiratory diseases, with a mean age of 54 ± 18 years and a mean IGSII of 28 ± 14. At inclusion, the mean value of the mean arterial pressure was 73 ± 10 mmHg and the mean value of blood lactates was 2.7 ± 0.7 mmol/L. Only one patient presented a non-fatal bleeding complication (Psoas hematoma).The following Table 1 summarises the echocardiographic parameters before and 24 h after thrombolysis.

TABLE 1 ECHOCARDIOGRAPHIC PARAMETERS BEFORE AND 24 H A

Echocardiographic parameters	Before thrombolysis	After thrombolysis	P
Right to left ventricle ratio RVs/LVS	1.1 ± 0.4	0.8 ± 0.4	0.006
sPAP (mmHg)	53 ± 15	42 ± 12	0.0001
TAPSE (mm)	17 ± 5	20 ± 4	0.007
Sa (cm/s)	12 ± 2	13 ± 2	0.2
VTI (cm)	15.7 ± 3	16 ± 3	0.8
LVEF (%)	56 ± 7	59 ± 8	0.1
Septal paradoxical motion	14	3	

During the follow up period (between 1 and 6 months), 5 patients had an echocardiographic examination which confirmed the improvement of the RV function: RVs/LVs decreased from 0.6 ± 0.1 to 0.5 ± 0.006 the sPAP decreased from 35 ± 8 to 26 ± 7, the TAPSE and the Sa remained stable.

CONCLUSION. Our results suggest that thrombolysis improves RV dysfunction after 24 h. This effect seems to be not transient up to a 6-month period of follow up and this with no fatal bleeding complications.

0613

ISSUE DOPPLER IMAGING VERSUS RADIONUCLIDE SCINTIGRAPHY IN EVALUATION OF RIGHT VENTRICULAR MYOCARDIAL INFARCTION

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BACKGROUND. Right ventricular (RV) infarction is detected in 30–50% of inferior wall myocardial infarction (MI). Early diagnosis of RV infarction complicating inferior wall MI can reduce morbidity and mortality.

AIM OF THE WORK. The objective of our study is to assess the usefulness of tissue Doppler imaging in evaluation of RVMI in patients (pts) with a first acute inferior MI in comparison to First Pass Radionuclide Angiography (FPRNA) which is the gold standard method. This is followed by a confirmative study by coronary angiography.

PATIENTS AND METHODS. Twenty-five pts with inferior wall MI as defined by elevated cardiac markers, chest pain, and ECG evidence of inferior MI (elevated ST segment of $\geq$1 mm in leads II, III, aVF) were subjected to full history, clinical examination, left 12-leads ECG, right chest leads ECG, cardiac markers, TDI to measure myocardial performance index (MPI) and maximum systolic velocity of the RV lateral annulus (Sm), first pass radionuclide angiography (to measure RVEF) and coronary angiography to define the occluded vessel and to localize the occlusion of RCA either before or after the RV branch.

RESULTS. Based on the nuclear study (FPRNA) our 25 pts were divided to Group I (GpI) 13 pts with RVEF $\geq$45% (57.38 $\pm$ 5.9) and Group II (GpII) 12 pts with RVEF <45% (37.08 $\pm$ 3.2). In GpI, 12 pts TDI showed MPI <0.7 (0.48 $\pm$ 0.07) and Sm $\geq$12 cm/s (13.89 $\pm$ 1.02 cm/s) and one pt. showed MPI $\geq$0.07 and Sm < 12 cm/s. In Gp II, 10 pts TDI exhibited MPI $\geq$0.7 and Sm <12 cm/s (0.81 $\pm$ 0.4 and 9.27 $\pm$ 1.7 cm/s, respectively) and 2 exhibited normal MPI and Sm (<0.7 and $\geq$12 cm/s, respectively). Based on the coronary angiography our 25 pts were divided to Gp A (11 pts) in whom the acute occlusion was in the RCA before the RV branch and Gp B (14 pts) in whom the acute occlusion was in coronary vessel other than the RCA or in RCA after the RV branch. From Gp A, 10 pts (91%) showed MPI $\geq$0.7 and Sm <12 cm/s and 1 showed normal MPI and Sm. From Gp B 13 pts (93%) showed normal MPI and Sm while 1 showed MPI $\geq$0.7 and Sm <12 cm/s.

CONCLUSIONS. (1) There is a significant correlation between TDI and FPRNA in the ability to detect RVMI by a sensitivity of 90.9% and specificity of 85.7% (*P* value 0.0001). (2) There is a good correlation between the TDI and coronary angiography in the ability to detect RVMI by sensitivity of 90.9% and specificity of 92.9% (*P* value 0.0001). (3) Compared to FPRNA, TDI is considered a new, easy, bed side and less expensive technique in assessment of RVEF.

0614

THE INCIDENCE AND THE PROGNOSTIC VALUE OF THE RIGHT VENTRICULAR (RV) DYSFUNCTION IN PATIENTS SUFFERING FROM ACUTE EXACERBATION OF CHRONIC OBSTRUCTIVE PULMONARY DISEASE (COPD)

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INTRODUCTION. The exacerbation of COPD still represent a major cause of mortality in the intensive care units. Few studies focused on the incidence and the prognostic value of the right ventricular dysfunction in this group of patients. Tricuspid annular plane systolic excursion (TAPSE) and Peak systolic motion velocity (Sa) determined by the tissue Doppler of the tricuspid annulus are simple echocardiographic measures which have already been shown to be correlated to the systolic right ventricular function in COPD patients at their baseline state. The diagnostic and the prognostic values of such parameters are still debated during the acute exacerbation of COPD.

THE AIM OF THE STUDY. Determine the incidence and the prognostic value of the right ventricular dysfunction in patients suffering from acute exacerbation of COPD.

PATIENTS AND METHODS. This is an observational study in which we included prospectively within an 8 month period all the patients admitted in our ICU for exacerbation of COPD. For all the patients, routine echocardiographic examination with standard projection was done and we collected mainly the following parameters: the RV surface, the systolic pulmonary artery pressure (sPAP), the inferior vena cava diameter, the TAPSE and the Sa. We also collected the demographic data of the patients, their anterior diseases, the severity scores (IGSII, APACHEII) and clinical data including the hemodynamic and the ventilatory parameters. The association of variables with the main outcome was evaluated by a univariate then a multivariate logistic regression survival analysis.

RESULTS. 83 patients were eligible for the study; mean age 67 $\pm$ 11 years, mean IGS II and APACHE II were, respectively 39 $\pm$ 18 and 17 $\pm$ 9. Seventy-one patients (85.5%) had echcardiographic signs of chronic pulmonary heart failure..All the patients needed a ventilatory support, 49 of them (59%) were intubated. 9 patients (10.8%) were shocked. The right to left ventricle surfaces ratio was 0.76 $\pm$ 0.26 and the mean sPAP was 50 $\pm$ 11 mmHg. The incidence of the RV dysfunction was 34.9% (mean TAPSE value of 1.77 $\pm$ 0.57 mm, mean Sa value of 13.4 $\pm$ 4.1 cm/s). There was no correlation between the sPAP and the TAPSE or the Sa. Mortality rate was 34.9%. Endotracheal intubation ($p = 0.000$); Shock ($p = 0.001$); RV dysfunction ($p = 0.000$); IGS II $\geq$39 (Se = 75%; Sp = 75%), APACHE II $\geq$ 16.5 (Se = 75%; Sp = 58%), VTI < 17 cm (Se = 82%; Sp = 75%), TAPSE < 1.44 cm (Se = 79%; Sp = 89%), and Sa < 12.3 cm/s (Se = 75%; Sp = 71%) were associated, at the univariate analysis, with an adverse outcome. At the multivariate analysis, only TAPSE (OR = 13.7; [2.38–79.2]), IGSII (OR = 6.26; [1.32–29.6]) and VTI (OR = 5.29; [1.15–24.18]) were associated to an adverse outcome.

CONCLUSION. The results of our study suggest that the RV dysfunction is frequent during the exacerbation of COPD. The TAPSE as a parameter of RV systolic function is an independent factor of mortality in addition to the VTI and the IGSII score.

0615

OUTCOMES, QUALITY-OF-LIFE AND INCIDENCE OF SYMPTOMS OF POST-TRAUMATIC STRESS DISORDER, ANXIETY AND DEPRESSION IN PATIENTS WITH FULMINANT MYOCARDITIS RESCUED BY EMERGENCY CIRCULATORY SUPPORT

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INTRODUCTION. Fulminant myocarditis is a rare disease that can be fatal without emergency circulatory support if refractory cardiogenic shock develops. Outcomes of these acutely ill patients remain poorly studied.

PATIENTS AND METHODS. We analyzed short- and long-term outcomes of 35 patients with fulminant myocarditis who received a mechanical circulatory assist device, e.g. ECMO or a biVAD (Thoratec®, Abiomed®) in our unit. Quality of life was evaluated with the Short-Form 36 questionnaire and symptoms of posttraumatic stress disorder (PTSD) and of anxiety and depression screened with the Impact of Event Scale and the Hospital Anxiety and Depression Scale, respectively.

RESULTS. ICU mortality was 34.3%. Independent predictors of ICU mortality were SAPS II >56 and troponin >12 µg/ml at ICU admission. Three patients received a heart transplant. Long term outcomes were evaluated in 19 patients (median follow-up, 888 days). Mean LVEF was 50 $\pm$ 10%. SF-36 scores were significantly lower for myocarditis patients compared to that of matched healthy controls for physical role, general health, vitality and social functioning, but higher than those reported for patients suffering from chronic diseases. Symptoms of PTSD and of anxiety and depression were reported by 10 and 30% of the long-term survivors, respectively.

CONCLUSION. Mechanical circulatory assistance can rescue >65% of otherwise fatal refractory cardiogenic shock due to fulminant myocarditis. Long term prognosis is favorable, despite persistent physical and social problems and a low incidence of symptoms of PTSD, anxiety and depression, which might benefit from tailored medical or psychosocial interventions.

Coagulation: 0616–0626

0616

THROMBELASTOGRAPHY AND PLATELET FUNCTION ASSAY IN CIRRHOSIS AND SEPSIS

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INTRODUCTION. Commonly measured global plasmatic parameters of coagulation fail to adequately reflect the hemorrhagic diathesis of cirrhotic patients. In addition, liver function, infection and coagulation are closely connected and sepsis may cause a further deterioration of hemostasis. Whereas thrombelastography has been used in the perioperative setting of liver transplantation, data on cirrhotic ICU patients are scarce.

OBJECTIVES. To evaluate rotational thrombelastometry (ROTEM) and Platelet Function Analyzer (PFA 100) in cirrhotic ICU patients.

METHODS. 64 patients [20 non-septic and non-cirrhotic patients as controls; 44 ICU patients with cirrhosis and no sepsis ($n = 23$), sepsis but no cirrhosis ($n = 7$) and cirrhotics with severe sepsis/septic shock ($n = 14$)] were evaluated using standard laboratory parameters, rotational thrombelastometry (ROTEM) and the Platelet Function Analyzer (PFA 100).

RESULTS. Comparing non-septic cirrhotic patients to non-septic non-cirrhotic patients, MELD-score [15 (11–20) vs. 6 (6–7); $p < 0.001$], INR [1.3 (1.2–1.6) vs. 0.9 (0.9–1.0); $p < 0.001$] and thrombin-time (TT) [17 s (16–19) vs. 15 s (14–16); $p < 0.001$] were larger in cirrhotics. D-dimers were increased [622 µg/L (301–851) vs. 219 µg/L (107–350); $p = 0.003$]; FVII [36% (23–53) vs. 104% (90–118); $p< 0.001$] and AT [49% (32–64) vs. 100% (90–118); $p < 0.001$] were decreased. Thrombocyte counts (TC) were also lower in cirrhotic [96G/L (57–166) vs. 350G/L (267–392); $p< 0.001$]. PFA (epinephrine) [177 s (110–258) vs. 104 s (91–112); $p = 0.001$] but not PFA (ADP) was impaired. INTEM clot formation time (CFT) [96 s (53–154) vs. 52 s (41–76); $p = 0.003$] and mean clot firmness (MCF) [51 mm (44 vs. 64) vs. 67 mm (60–70); $p < 0.001$] were impaired, but not clotting time (CT).

Among cirrhotic patients, sepsis was associated with higher readings of the endotoxin activity assay (EAA) [0.556 (0.402–0.683) vs. 0.416 (0.346–0.463); $p = 0.021$] and higher values for procalcitonin (PCT) [4.1 ng/ml (1.4–8.2) vs. 0.2 ng/ml (0.2–1.7); $p < 0.001$] and IL-6 [90 pg/ml (40.3–123.2) vs. 29.3 pg/ml (4.2–157.8); $p = 0.074$].

TT [19 s (18–60) vs. 17 s (16–19); $p = 0.021$] was prolonged in septic cirrhotic, whereas there were no differences in d-dimers, antithrombin or TC. There were no differences in PFA (epinephrine), PFA (ADP) or INTEM-CT, -CFT or -MCF between septic and non-septic cirrhotics.

Among cirrhotic patients we found correlations between PFA (ADP)—but not PFA (epi)—and TC ($r = -0.373$; $p = 0.043$), INTEM-CFT ($r = -0.745$; $p < 0.001$) and MCF ($r = 0.727$; $p < 0.001$). INTEM-CT was correlated with EAA ($r = 0.379$; $p = 0.030$) and PCT ($r = 0.452$; $p = 0.009$), INTEM-CFT was correlated with TC ($r = 0.745$; $p < 0.001$), INR ($r = -0.352$; $p = 0.045$) and PFA (ADP) ($r = 0.373$; $p = 0.043$).

CONCLUSIONS. ROTEM and the PFA 100 assay may be useful for the assessment of cirrhotic coagulopathy. Whereas results of PFA and ROTEM differed between cirrhotic and non-cirrhotic patients, neither method discriminated between septic and non-septic cirrhotic patients.

0617

EVOLUTION IN COAGULATION PARAMETERS OVER THE FIRST 3 DAYS OF ICU ADMISSION IN SEPTIC SHOCK PATIENTS: IMPACT ON 30 DAY MORTALITY

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INTRODUCTION. Readily available coagulation parameters, and more particularly the evolution of these parameters within the 24 h of ICU admission, have been found to be of prognostic importance in severe sepsis and septic shock patients. The aim of this study was to assess whether the evolution of these parameters within the first 3 days of admission remains of prognostic importance in septic shock patients.

MATERIAL AND METHODS. Variables were retrieved from a large computerized database including all consecutive patients admitted to the Ghent University hospital surgical (2004–2008) and medical (2006–2008) ICU. All patients requiring >100 ng/kg per minute norepinephrine in combination with antibiotic therapy for >48 h were included. The impact of routine laboratory variables reflecting organ (dys)function on 30 day mortality was assessed by multiple logistic regression analysis in SAS. Three models were built : one including coagulation parameters [prothrombine time (PT), activated partial thromboplastin time (aPTT), fibrinogen, and platelets] only, a second additionally including indicators of renal function and inflammation (ureum, creatinine, C-reactive protein, leucocyte count and Hgb) and a third additionally including important interventions (mechanical ventilation, fluid balance and hemodialysis) and age. Evolutions in parameters were modeled trough differences between consecutive days. All continuous variables had a linear relationship with the outcome. Area under the receiver characteristic curve (AUC) and the Hosmer–Lemeshow test (HL-test, p value) were calculated for each model.

RESULTS. 30 day-mortality rates in the total cohort ($n = 406$), in patients requiring ventilation ($n = 372$), dialysis ($n = 107$) or both ($n = 98$) were 33.7, 36.8, 46.7 and 51%, respectively. Low PT (%) levels on admission, absence in recovery of PT and fibrinogen within the first 3 days and a low platelet count on day 3 were independently associated with mortality in all 3 models ($p < 0.05$). The protective effect of the fibrinogen increase within the first 3 days was attenuated in patients with a concomitant increase in creatinine levels (interaction term $p = 0.04$). Creatinine by itself and other indicators of renal failure (urea, dialysis) were not informative as long as the coagulation parameters remained in the model. The AUC and the HL-test for the model containing coagulation parameters only and for the final model additionally adjusted for age ($p = 0.005$), mechanical ventilation ($p = 0.003$) and leucocyte count ($p = 0.02$) were 0.71 and $p = 0.37$, and 0.80 and $p = 0.90$, respectively.

CONCLUSION. Low PT and platelet levels upon admission and on day 3, respectively, and more particularly the absence in recovery of PT and fibrinogen within the first 3 days of admission are important independent predictors of 30 day mortality in septic shock patients and are more informative than variables reflecting renal function within this period.

0618

RELATIONSHIP BETWEEN ACUTE-PHASE DIC DIAGNOSIS OF JAAM (JAPANESE ASSOCIATION FOR ACUTE MEDICINE) AND SEPSIS RELATED FACTORS

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INTRODUCTION. The Japanese Association for Acute Medicine (JAAM) published their diagnostic criteria for acute-phase disseminated intravascular coagulation (DIC) in 2005 [1]. Recently, new sepsis-related factors, such as high-mobility group box protein 1 (HMGB1) [2] and endocannabinoids (*N*-arachidonoylethanolamine [AEA] and 2-arachidonoyl glycerol [2-AG]), have been reported [3]. Interleukin-6 (IL-6) is a common inflammatory cytokine. Meanwhile, plasminogen activator inhibitor (PAI-1) and protein C are important coagulation factors reportedly involved in the coagulation cascade in sepsis. The relations between the JAAM diagnostic criteria of acute-phase DIC and these sepsis-related markers has not been previously reported.

OBJECTIVE AND METHODS. A retrospective analysis was performed in 44 patients with septic shock who were admitted to our intensive care unit between 2005 and 2008. The patients were separated into two groups: a DIC group (34 cases), in which the patients were diagnosed according to the JAMM criteria for DIC, and a non-DIC group (10 cases). In addition, the levels of several sepsis-related factors (HMGB1, AEA, 2-AG, IL-6, PAI-1 and protein C) were measured. The severity scores and the levels of the sepsis-related factors were then compared between the two groups.

RESULTS. The average Acute Physiology and Chronic Health Evaluation (APACHE) II score (DIC group, 28.8 ± 7.8; non DIC group, 21.8 ± 9.0; $p = 0.0202$) and the average sepsis-related organ failure assessment (SOFA) score (DIC group, 12.6 ± 4.9;. non-DIC group, 8.7 ± 2.1; $p = 0.0176$) differed significantly between the two groups. Furthermore, the protein C level of the DIC group (30.9 ± 13.0%) was significantly lower than that of the non-DIC group (56.3 ± 45.6%) ($p = 0.0097$). However, the levels of the other sepsis-specific factors (PAI-1: 155.6 ± 57.7 ng/mL in DIC group and 141.3 ± 69.5 ng/mL in non-DIC group; IL-6: 13912.6 ± 24018.2 pg/mL and 8453.6 ± 12090.7 pg/mL; HMGB-1: 14.7 ± 18.7 ng/mL and 5.3 ± 6.4 ng/mL; AEA: 544.4 ± 698.6 pg/mL and 557.9 ± 444.3 pg/mL; and 2-AG: 15.1 ± 28.4 ng/mL and 10.6 ± 8.4 ng/mL) were not significantly different between the two groups.

CONCLUSION. Activated protein C treatment might be useful for the treatment of septic shock, as a significant correlation was observed between the protein C level (indicating the extent of coagulation disorder) and a diagnosis of DIC according to the JAAM criteria. A diagnosis of DIC according to the JAAM criteria seems to be a useful indicator of severe septic shock and coagulation disorder.

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0619

RETROSPECTIVE ANALYSIS OF ANTITHROMBIN III SUPPLEMENTATION THERAPY EFFECTIVENESS IN SEPSIS CASES

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INTRODUCTION. Although controversial, early antithrombin III (AT-III) treatment after a diagnosis of septic disseminated intravascular coagulation (DIC) according to the Japanese Association for Acute Medicine (JAAM) criteria [1] seems to be an effective strategy for managing septic DIC. We analyzed the outcomes of a large number of patients with sepsis who were or were not treated with AT-III.

OBJECTIVE AND METHODS. A retrospective analysis was performed in 88 sepsis patients who had been admitted to our intensive care unit between January 2000 and December 2008. The patients were separated into two groups for analysis: an AT-III group (34 cases), in which the patients were treated with AT-III, and a non-AT-III group (54 cases), in which AT-III treatment was not administered. In addition, a sub-group analysis was performed in 52 septic patients diagnosed as having DIC according to the JAMM criteria.

RESULTS. The average Acute Physiology and Chronic Health Evaluation (APACHE) II score (AT-III group, 25.5 ± 8.6; non-AT-III group, 23.1 ± 9.5) and the average sepsis-related organ failure assessment (SOFA) score (AT-III group, 11.0 ± 4.0;. non-AT-III group, 11.1 ± 4 0.8) were not significantly different between the two groups. The overall survival rate was 54.5% (a good outcome, judging by the APACHE II score), and the outcome was significantly related to the APACHE II score, the SOFA score, and a diagnosis of septic DIC according to the JAAM criteria ($p = 0.0137$). The outcome of the AT-III group was significantly better than that of the non AT-III group ($p = 0.0066$) (Fig. 1-1). Among the DIC cases, the survival rate of the AT-III group (25 cases) was significantly better than that of the non-AT-III group (27 cases) ($p = 0.0031$) (Fig. 1-2).

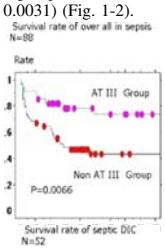

Figure 1-1,2

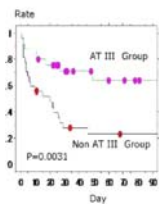

Figure 1-1,2

CONCLUSION. Antithrombin-III supplementation therapy is effective for the treatment of sepsis and the JAAM criteria for DIC seem to be useful for evaluating the severity of sepsis.

REFERENCE. 1. Gando S, Iba T, Eguchi Y et al (2006) A multicenter validation of disseminated intravascular coagulation diagnostic criteria for critically ill patients: comparing current criteria. Crit Care 34:625–631

0620

PREVENTION OF VENOUS THROMBOEMBOLISM IN CRITICAL CARE PATIENTS WITH MULTIORGANIC FAILURE: ARE WE USING APPROPRIATE DOSAGE?

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INTRODUCTION AND OBJECTIVES. Critically ill patients present a marked tendency to thromboembolic disease, which condition an accurate antithrombotic profilaxis. Low-molecular-weight heparins (LMWHs) are first choice in this profilaxis. Our aim is to evaluate the LMWH profilactic efficiency, by determining of antifactor Xa activity, in the thromboembolic disease in patients with malfunction of 2 or more organs.

Methods. All adult patients with 2 or more organ failure admitted in ICU with no exclusion criteria: anuric renal failure, dialysis indications, administering of oral anticoagulants 7 days prior to admission, unfractionated heparin or LMWH, pregnancy or thrombocytopenia on admission. Daily monitoring during the first 7 days of the peak and though levels of the activity level of antifactor Xa. Enoxaparine at dose of 40 mg/day subcutaneously was used (if clearance < 30 ml/min, 20mgr). Daily measurement of creatinine clearance, SOFA score, seric creatinine, coagulation, hemoglobin, platelets, antithrombin III, arterial blood lactate, hidric balance and complications were recorded.

RESULTS. 11 patients were included in the study. To evaluate antifactorXa activity, peak and though levels were determined on days 2, 3, 5, and 7 of treatment. Nearly all though levels (97.7%) have a value of 0 U/ml. The average peak levels were 0.01 ± 0.96 UI/ml, 0.19 ± 0.15 U/ml, 0.19 ± 0.25 and 0.30 ± 0.20 UI/ml without statistical significance. Only the progression of antithrombim showed statistical change ($p < 0.05$). No significant differences were found between levels of antifactor Xa along progression (dead/alive), neither in the presence of hidric balance positive or negative nor in the use of vasoactive drugs.

CONCLUSIONS. During the first 7 days of treatment it has been observed an insufficient level of antifactor Xa activity which, although progressibly increasing by day, 7 day remained insufficient in 38% of cases. This group of critically ill patients should be studied as a different in a different perspective and evaluate practical implications of these results.

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0621

ARTERIAL AND VENOUS THROMBOEMBOLIC COMPLICATIONS IN HEPARIN-INDUCED THROMBOCYTOPENIA (HIT) PATIENTS: COLOR DOPPLER SCANNING EVALUATION

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INTRODUCTION. Heparin-induced Thrombocytopenia (HIT) is estimated to occur in 1–5% of all patients receiving heparin. The purpose of this study was to investigate by color Doppler ultrasonography (CDUS) the incidence of thromboembolic complications in medical critically ill patients with HIT.

METHODS. Over a period of 2 years 78 Intensive Care Unit patients (aged 39–89) that presented thrombocytopenia were investigated for HIT and underwent arterial and venous CDUS examination of lower limbs (156 legs). HIT was proven by a positive platelet aggregation test in 29 patients. Orthopedic, surgical and cardio surgical patients were not included in the study. We evaluated artery lumen and vein diameter using B-mode and compression ultrasonography. Flow spectra were evaluated with Doppler scan mode and flow parameters were calculated for the femoral, popliteal and calf arteries and veins.

RESULTS. The HIT group consisted of 17 females and 12 male patients. Twenty-nine patients (37%) suffered lower extremities thromboembolic complications. Nineteen patients (65%) had arterial thrombosis, most prominent of the common femoral, superficial femoral and posterior/anterior tibial artery. Eight subjects (27%) had deep venous thrombosis, most prominent of the common femoral and superficial femoral vein.

CONCLUSION. Our study confirmed the remarkably high incidence of thromboembolic complications, mostly arterial, in critically ill patients with HIT. The routine CDUS of the lower limb arteries and veins is the faster, very safe, non-invasive radiological procedure which gives optimal information for the urgent treatment of these patients.

0622

FIBRINOLYSIS SYSTEM, MONITORED BY THROMBOELASTOGRAPHY (TEG) AND PAI-1 ACTIVITY, IN SEPTIC PATIENTS UNDERGOING TIGHT GLYCEMIC CONTROL

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INTRODUCTION. Hyperglicemia is associated with profound suppression of fibrinolysis, due to elevated levels of the fibrinolytic inhibitor, PAI-1. It has become evident that the fat-laden insulin-resistant adipocyte generates PAI-1, strengthening the link between diabetes and suppression of fibrinolysis. Same studies, involving critically ill patients, intensive insulin therapy to maintain euglycemia (glucose level, 80–110 mg/dl) lowered in-hospital mortality mostly by reducing deaths from multiple organ failure. But the risks and benefits of tightly regulated glucose in different ICU populations was an area of intense investigation yielding conflicting results. Our aim was to evaluate the fibrinolytic system in septic patients undergoing conventional (<180 mg/dl) or Tight Glycemic Control (TGC) (<120 mg/dl)

METHODS. Actually we enrolled 16 severe sepsis and septic shock patients, without history of tipe-1 diabetes, admitted in our ICU more than 48 h, randomized to either conventional or TGC groups. Plasma levels biochemical markers for fibrinolysis and coagulation and TEG were determined every day for 2 weeks and then on study days 17, 20, 23, and 28. Clinical data and sepsis-related organ failure assessment (SOFA) scores were also recorded.

RESULTS. The two groups had similar characteristics at baseline. A total of three patients (37.5%) in the TGC group and four (50%) in the conventional group died. Severe hypoglycemia (blood glucose level, < or = 40 mg/dl) was reported in 1 of 8 patients (12.5%) in the TGC group and none in the conventional group patients. Table 1 shows the fibrinolytic and the coagulation assay monitored by TEG.

DISCUSSION. A small enhancement of fibrinolysis could be observed in the TGC group, as indicated by the Ly30 and Ly60 and PAI-1. Morbidity, rated with the Sepsis-related Organ Failure Assessment score, was lower in the TGC group.

CONCLUSION. Intravascular and extravascular fibrin formation are characteristic findings in patients with sepsis, suggesting that the activation of coagulation and the inhibition of fibrinolysis are important in the pathogenesis of sepsis. In this context, tight glycemic control seems to reduce the fibrinolytic impairment and morbidity (Table 1)

TABLE 1 COAGULATION STATUS. MEAN (SD)

	Baseline	Conventional		Baseline	TGC	
		Day 7	Day 14		Day 7	Day 14
r (min)	4.3 (1.4)	5.1 (1.6)	5.9 (0.8)	4.8 (1.8)	5.5 (1.3)	6.1 (1.3)
MA (mm)	59 (12)	64 (9)	47 (13)	53 (8)	59 (10)	44 (14)
Ly 30 (%)	3.6 (1.2)	2.9 (1.6)	1.6 (0.8)	3.2 (1.9)	3.6 (1.6)	3.9 (1.2)
PAI-1 (U/ml)	2.5 (0.4)	3.5 (1.1)	5.2 (1.3)	3.1 (0.6)	3.4 (0.9)	2.9 (1.1)
AT III (%)	65 (9)	78 (10)	75 (9)	48 (10)	77 (13)	81 (11)
PC (%)	54 (7)	81 (8)	88 (7)	52 (6)	79 (9)	75 (15)
SOFA	6.2 (0.9)	5.3 (1.4)	5.4 (1.7)	5.2 (1.9)	4.6 (1.5)	4.3 (1.4)

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0623

ROTATIONAL THROMBELASTOMETRY TO ASSESS THE COAGULATION SYSTEM IN SEVERE SEPSIS AND THE SYSTEMIC INFLAMMATORY RESPONSE SYNDROME: A PROSPECTIVE, CONTROLLED TRIAL

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INTRODUCTION. Few data on the course of rotational thrombelastometry (RoTEM) results in patients with severe sepsis and postoperative SIRS have been reported.

OBJECTIVE. To describe RoTEM results in patients with infection, severe sepsis, with or without postoperative SIRS and to define the incidence of hyper- and hypocoagulation and its association with mortality.

METHODS. Patients presenting with either severe sepsis ($n = 49$) or postoperative SIRS ($n = 27$) were included. Patients with infection but no systemic inflammation ($n = 10$) and patients after non-cardiac surgery without SIRS ($n = 10$) served as controls. Age <19 years, cardiac surgery, massive transfusion, discharge from the intensive care unit (ICU) or hospital before day 7, central nervous pathology or pregnancy were exclusion criteria. RoTEM and standard coagulation tests were performed within 36 h after ICU admission, on day 4 and 7. Hyper- and hypocoagulation were defined as deviations above and below reference ranges for RoTEM analyses (3). Descriptive methods, student's *t* tests and mixed effects models were used for statistical analysis.

RESULTS. Mean values of RoTEM analyses were within reference ranges in all study and control groups. However, results were extremely heterogeneous showing signs of hypercoagulation in ~50% (severe sepsis), 70–75% (infection), 20–50% (SIRS) and 20–60% (no SIRS) of patients. Hypercoagulation resulted from an increase in the maximum clot firmness (MCF) in 69.3%, a combined MCF increase and shortening of the coagulation (CT) or the clot formation time (CFT) in 26.8%, and an isolated shortening of the CT/CFT in 3.9% of patients. Hypocoagulation was detected in one-third (severe sepsis, SIRS, no SIRS) and 10–50% (infection) of patients. Mixed coagulation disorders and RoTEM results within reference ranges were found in 10–20% and in one-third of patients in all groups. During the study period, patients with infection showed a shorter CFT ($p = 0.02$) and higher MCF ($p = 0.01$) than patients with severe sepsis. Patients without SIRS had a shorter CT ($p < 0.001$) than patients with SIRS. RoTEM variables significantly correlated with organ dysfunction (direct correlation for CT and CFT, indirect correlation for MCF; all $p < 0.001$). Changes in RoTEM results over time were associated with different 28 day mortality ($p < 0.001$). Mortality was lowest in patients in whom RoTEM results normalized (0%) or signs of hypercoagulation developed (9.1%) and highest in those presenting with hypocoagulation throughout the study period (58.3%).

CONCLUSIONS. Coagulation disturbances in severe sepsis and SIRS are extremely heterogeneous. Hypercoagulation is most frequent in patients without systemic inflammation and associated with low mortality. Patients with hypocoagulation appear to have the highest mortality.

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0624

DOES ACTIVATED PROTEIN C INFLUENCE THE COAGULATION SYSTEM ASSESSED BY THE ROTATIVE THROMBOELASTOMETRY ANALYSIS

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INTRODUCTION. Activated Protein C (aPC)-treated patients demonstrated antithrombotic (reduced markers of thrombin generation and accelerated normalization of anticoagulant factor, protein C and fibrinolytic factors) and anticoagulant effects (prolonged PT and APTT) [1]. Thromboelastometry (RoTEM) is a whole blood assay allowing to evaluate the viscoelastic properties during blood clot formation and lysis. The aim of this study was to use the RoTEM measurements to assess the effects of aPC treatment.

METHODS. In 15 patients with severe sepsis, we performed RoTEM measurements (Intem and Extem) and measured PT, APTT, fibrinogen, D-dimers and platelet count before and on the first day of treatment with aPC. RoTEM parameters included coagulation time (CT), kinetics of clot formation (CFT) and clot firmness (angle α), maximum clot firmness (MCF) and maximum clot lysis (ML). All variables were analyzed with SSPS statistical program and compared by a Student's *T*-test. A *p* value <0.05 was considered as significant.

RESULTS. Only the CT Intem increased significantly, reflecting the significant prolongation of APTT increase with aPC treatment (44[32–48] to 56 [41–76] s, $p < 0.001$).

CONCLUSIONS. RoTEM gives no additional information on the coagulation during aPC treatment for severe sepsis (Table 1)

TABLE 1

	INTEM		EXTEM	
	Before aPC	After aPC	Before aPC	After aPC
CT (s)	174 [150–187]	216 [204–230]*	78 [68–153]	98 [69–245]
CFT (s)	65 [50–127]	57 [48–161]	68 [51–118]	69 [62–167]
Angle α (°)	78 [71–81]	78 [66–81]	77 [68–80]	78 [66–81]
MCF (mm)	66 [63–74]	68 [50–75]	67 [64–75]	69 [47–77]
ML (%)	11[8–12]	11 [6–13]	13 [9–18]	11 [6–13]

* $p = 0.004$

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0625

RECOVERY FROM THROMBOCYTOPENIA AFTER REMOVAL OF PULMONARY ARTERY CATHETER

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INTRODUCTION. Thrombocytopenia is a common complication in critically ill patients. We frequently noted that platelet counts in thrombocytopenic patients with pulmonary artery catheters (PAC) recover faster after removal of the PAC. Literature on this subject is scarce [1, 2] and analysis of this phenomenon is compounded by the wide spectrum of causes of thrombocytopenia.

OBJECTIVES. To analyse the quantitative impact of removal of a PAC on platelet counts.

METHODS. From January 2007 up to June 2008 all patients from the Thoracic Intensive Care Unit who were monitored with a PAC for more than 3 days were included. The platelet counts (reference range 150–300 10^9/L) for these patients were recorded. We studied the period that the PAC was in situ and a period of at least 3 days after removal of the PAC. The day-to-day difference in platelet counts (ΔPC; expressed in 10^9/L per day) was determined.

RESULTS. In total 52 patients were identified. 43 had thrombocytopenia on the day of removal of the PAC In 13 patients the nadir of the platelet count occurred 3 or more days before the removal of the PAC. Three patients did not display thrombocytopenia during their entire stay.

As expected, mean ΔPC before PAC removal was significantly lower than mean (±SD) ΔPC after removal -3.9 ± 18.2 versus 24.5 ± 24.3 10^9/L per day, respectively ($p < 0.0001$).

It was also observed that for the 13 patients whose platelet count nadir occurred 3 or more days before removal of PAC the mean ΔPC before removal was positive but significantly lower than mean ΔPC after removal (15.0 ± 10.4 vs. 41.1 ± 24.8 10^9/L per day, respectively; $p = 0.003$). This indicates a faster rise in platelet counts after removal of the PAC. After PAC removal there was no significant difference in ΔPC between this subgroup and the main group.

CONCLUSIONS. In the majority of patients with a PAC, platelet counts tended to decrease until removal of PAC. In those patients who did display a rise in platelet counts before removal of PAC, recovery of the platelet count was lower with a PAC in situ than post removal. These data suggest that in thrombocytopenic patients timely removal of a PAC should be considered as a measure to improve recovery of platelet counts. More research on this subject is warranted.

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GRANT ACKNOWLEDGEMENT. None.

0626

PULMONARY COAGULOPATHY IN PEDIATRIC ALI/ARDS

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BACKGROUND AND OBJECTIVES. ALI/ARDS are the major causes of respiratory failure, morbidity and mortality among children in pediatric intensive care units (PICUs) worldwide. Prior works have shown disordered of inflammation and coagulation in ALI/ARDS. Activated protein C (PC) is a critical endogenous regulator of coagulation and inflammation in patients with ALI/ARDS. However, the role of PC in pediatric ALI/ARDS is still obscure. The aim of this study was to investigate the association between PC activity, coagulogram and clinical outcomes.

DESIGN. Prospective, Descriptive study.

METHODS. Infants and children (age 1 month–16 years, July 2007–December 2008) who were admitted to PICU with clinical and laboratory diagnosis of ALI/ARDS. Clinical data were recorded and blood samples kept for further analysis. We then measured the initial basic coagulogram, the levels of PC activity and protein S antigen (PS).

RESULT. 27 patients were included, mean age was at 6.4 ± 5.17 years, 17 were male (63%) and 10 were female. 15(55%) were survivors and 12(45%) were non-survivors. Basic coagulogram, e.g. Platelets, PT and PTT were significantly different between survivors and nonsurvivors ($P = 0.01$, 0.025, 0.01).The mean plasma PC activity (%) was 72.0 ± 27.6. The mean plasma PS antigen was 58.52 ± 29.85. There was significantly higher plasma PC activity in patients who age >8 year than lower age group ($P = 0.03$). Both plasma PC activities, PS antigen children with ALI/ARDS were lower than normal children. Plasma PC activity and protein S antigen (PS) levels were not significant different between the survivors and nonsurvivors ($P = 0.56$, 0.85) There was significant correlation between plasma PC with initial systolic blood pressure ($r = 0.5$, $P = 0.008$) and PS antigen ($r = 0.41$, P = 0.026). Also, there was a trend of negative correlation between plasma PC with days of ventilator used ($r = 0.03$, $P = 0.1$) and Length of stay in PICU ($r = 0.03$, $P = 0.09$).

CONCLUSION. This study suggested that most of pediatric ALI/ARDS had abnormal coagulograms including protein C activity and protein S Ag. Children with ALI/ARDS had lower PC activity/Protein S AG compared to normal control. Plasma PC activity and PS antigen levels were tended to have negative correlation with days of ventilator used and length of stay in PICU.

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Sepsis: Pathophysiology 2: 0627–0640

0627

A NOVEL DDAH1 INHIBITOR IMPROVES SURVIVAL IN A LONG TERM CONSCIOUS MODEL OF SEPTIC SHOCK

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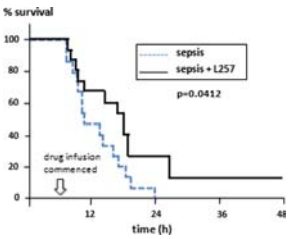
INTRODUCTION. DDAH (dimethylarginine dimethylaminohydrolase) metabolizes ADMA, an endogenous inhibitor of nitric oxide (NO) synthase [1]. DDAH inhibition thus offers a novel means of modulating excess NO production in septic shock. As the DDAH-2 isoform is present in immune cells, selective inhibition of the DDAH-1 isoform may improve haemodynamics without compromising immune function. We thus studied the impact on survival of the novel DDAH1 inhibitor, L-257, in a conscious rat model of septic shock

METHODS. Conscious instrumented male Wistar rats (approx 300 g body weight) received 1.8 ml faecal slurry intraperitoneally. When blood pressure (BP) dropped 20% below baseline level (at approx 5–6 h), 1–3 × 10 ml/kg Voluven fluid challenges were given i.v. to restore pressure, followed by continuous infusion of a 1:1 mix of *n*-saline + 5% glucose at a rate of 10 ml/kg per hour. Treated animals also received 3 mg/kg bolus of L-257 followed by a continuous infusion of 125 mcg/h. Animals were observed until 48 h or death. A Kaplan–Meier survival analysis was performed.

RESULTS. L-257-treated septic animals ($n = 15$) showed a significant improvement in survival compared to untreated animals ($n = 15$) (Fig. 1). Median survival was 18 vs. 10.5 h ($p = 0.0412$). Blood pressure was better maintained in the L-257 treated animals.



L-257 survival

CONCLUSIONS. Selective DDAH-1 inhibition improved haemodynamics and survival in this severe, long-term, fluid-resuscitated, conscious model of septic shock. This offers a new, potentially safer, paradigm for NO modulation and a putative therapy.

FUNDING. The Wellcome Trust.

REFERENCE. Leiper J et al (2007) Nature Med 13:198–203.

0628

COMPARISON OF DDAH-1 INHIBITION AND NOS INHIBITIOR L-NMMA IN AN ENDOTOXAEMIC RAT MODEL

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INTRODUCTION. DDAH (dimethylarginine dimethylaminohydrolase) metabolizes ADMA, an endogenous inhibitor of nitric oxide (NO) synthase. Selective inhibition of the DDAH-1 isoform may improve haemodynamics in septic shock without compromising immune function [1]. We thus compared the impact the effects of the novel DDAH1 inhibitor, L-257, versus the non-specific NOS inhibitor, L-NMMA at a large dose in a rat model of endotoxaemic shock.

METHODS. Anaesthetized, spontaneously breathing, cannulated, male Sprague–Dawley rats (approx 300 g body weight) received 40 mg/kg Klebsiella pneumoniae LPS was given i.v. over 30 min. Thereafter, all animals received 10 ml/kg/h fluid resuscitation (9:1 mix of 5% glucose + Gelofusin). When blood pressure fell >20% below baseline (approx 120–150' post-LPS), groups ($n = 5$) received placebo, L-NMMA (20 mg/kg per hour) or L-257 (3 mg/kg bolus then 125 µg/h infusion) for 2 h. Animals were observed for a further 1.5 h after terminating the drug infusion. Blood gas analysis and echocardiography were performed at baseline and study end.

RESULTS. Two animals died in the placebo and L-NMMA groups, and 1 in the L257 group. Haemodynamics and blood gas analyses were better maintained in the L-257 treated animals (Table 1, $^*p < 0.05$ vs. placebo at the end of study).

TABLE 1 * $P<0.05$ VERSUS PLACEBO AT THE END OF STUDY

	Blood pressure (mmHg)	Stroke volume (L)	Base excess (mmol/l)
Placebo	68.5 ± 26.9	0.12 ± 0.05	-13.5 ± 4.2
L-NMMA	61.3 ± 25.8	0.13 ± 0.1	-13 ± 3.6
L-257	88.7 ± 21.5*	0.19 ± 0.03*	-7.9 ± 4.9*

CONCLUSION. Selective DDAH-1 inhibition improved haemodynamics in this severe, short-term, fluid-resuscitated, endotoxic shock model. This offers a new, potentially safer, paradigm for NO modulation.

FUNDING. The Wellcome Trust.

REFERENCE. Leiper J et al (2007) Nature Med 13:198–203.

0629

UNCOUPLING PROTEIN-3 MEDIATES THE LOSS OF MITOCHONDRIAL MEMBRANE POTENTIAL IN SEVERE SEPSIS

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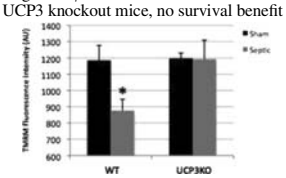
INTRODUCTION. The mitochondrial respiratory chain pumps protons out of the mitochondrial matrix, generating a proton gradient [expressed as a mitochondrial membrane potential ($\Delta\psi$m)] that drives ATP production. Uncoupling protein-3 (UCP3), a member of a family of transporter molecules found in the inner mitochondrial membrane, may translocate protons back into the mitochondrial matrix, uncoupling respiratory chain activity from ATP generation. However, this would also lower $\Delta\psi$m, reducing the mitochondrial production of reactive oxygen species (ROS) and thus potentially offering protection (Brand 2005).

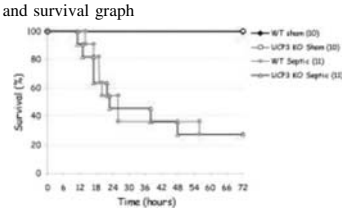
OBJECTIVES. Though UCP3 mRNA and protein levels are increased in sepsis, the significance is unknown. We have shown that $\Delta\psi$m is reduced in skeletal muscle of mice with severe sepsis. In the present study, we investigated the effect of severe sepsis on $\Delta\psi$m, comparing both UCP3 wildtype (WT) and knockout (KO) mice.

METHODS. After 24 h of faecal peritonitis (or sham-operated controls), WT and UCP3 KO mice ($n = 6$ per group) were sacrificed. $\Delta\psi$m was measured in freshly isolated, perfused diaphragm muscle using a voltage-dependent fluorescent probe, tetramethylrhodamine methyl ester (TMRM) 100 nM. TMRM excitation was imaged using a Zeiss 510 multiphoton confocal microscope. UCP3 protein in tibialis anterior muscle was quantified by immunoblotting. In a separate study, the impact of UCP3 on survival from intraperitoneal sepsis was investigated by comparing mortality of WT and UCP3 KO animals over a 48 hr period ($n = 10$–11 per group).

RESULTS. UCP3 protein abundance was 1.8 fold higher in septic WT mice at 24 h compared to paired sham animals ($p < 0.05$) while $\Delta\psi$m was significantly reduced (by 26%; *t test $p < 0.05$). Crucially, no significant change in $\Delta\psi$m was found in the UCP3 KO mice (Fig. 1). Despite the maintained $\Delta\psi$m in septic UCP3 knockout mice, no survival benefit was observed (Fig. 2).



TMRM fluorescence and survival graph



CONCLUSION. UCP3 appears to mediate the reduction in $\Delta\psi$m of skeletal muscle of mice during severe sepsis. However, this does not confer a survival benefit in a severe model of sepsis. Further work will explore how this affects the rate of ATP generation, ROS production and the overall function of skeletal muscle in sepsis.

REFERENCE. Brand MD, Esteves TC (2005) Cell Metab 2(2):85–93.

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0630

MITOCHONDRIAL RESPIRATORY CAPACITY GRADUALLY INCREASES DURING THE FIRST WEEK IN PATIENTS WITH SEVERE SEPSIS OR SEPTIC SHOCK—A TEMPORAL ANALYSIS OF MITOCHONDRIAL FUNCTION IN PLATELETS USING HIGH-RESOLUTION RESPIROMETRY

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INTRODUCTION. Severe sepsis and septic shock often results in multiple organ failure (MOF) which is the leading cause of death in these patients. The cause of MOF is still unknown but bioenergetic failure due to mitochondrial dysfunction has been proposed as a plausible mechanism. Human studies are scarce and have mainly investigated mitochondrial function of muscle biopsies taken during early stages of sepsis. Platelet mitochondria are readily obtained via blood sampling and their respiratory function could potentially be used as a non-invasive biomarker of mitochondrial function in remote organs.

OBJECTIVES. The aim of the present study was to establish high-resolution respirometry of platelet mitochondria in patients with severe sepsis or septic shock and investigate temporal changes of respiration during the first week after admission to the ICU.

METHODS. Platelets were rapidly isolated from blood samples taken from 18 patients with severe sepsis or septic shock within 48 h of their admission to the intensive care unit. Subsequent samples were taken on day 3–4 and day 6–7. Ten healthy blood donors served as controls. Platelet mitochondrial function was determined in an Oroboros O_2 k high-resolution oxygraph. Endogenous respiration was determined in intact platelets and to investigate the activity of the individual complexes of the respiratory chain, platelets were permeabilised with digitonin and stimulated with complex specific substrates and inhibitors.

RESULTS. During the first week, following admission to the ICU, mitochondrial respiratory capacity increased significantly in septic patients. Endogenous respiration of intact platelets increased gradually following admission and was increased by 29% on day 6–7 compared to the initial value (within 48 h of admission). In permeabilised platelets complex I-stimulated respiration increased 27% and 47%, complex II-stimulated respiration 23% and 38% and convergent stimulation (complex I+II) 23% and 40% on day 3–4 and day 6–7, respectively. Compared to healthy controls respiration parameters on day 6–7 were increased significantly. Somewhat surprisingly, no significant differences compared to control values could be detected at admission (within 48 h) or day 3–4.

CONCLUSIONS. We demonstrate that mitochondrial respiration in platelets is a sensitive and reproducible parameter that is well suited for detailed and temporal analysis of mitochondrial bioenergetics. We conclude that platelet mitochondria in septic patients gradually increase their respiratory capacity during the first week following admission to the ICU.

0631

PHOSPHOINOSITIDE-3 KINASE GAMMA ACTIVITY CONTRIBUTES TO BACTERIAL DISSEMINATION DURING ABDOMINAL SEPSIS

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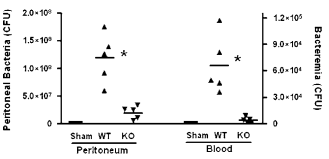
INTRODUCTION. Sepsis is characterized by bacterial infection and the presence of systemic inflammation, which often leads to multiple organ failure (MOF) and death. During severe septic shock, impaired neutrophil recruitment to the site of infection leads to lack of adequate bacterial control, thereby allowing bacterial expansion and dissemination. Phosphoinositide-3 kinase gamma (PI3 Kgamma), an isoform of the PI3K cell signalling family, is known to alter neutrophil migrations and contribute to sepsis-induced organ damage; however, its role in the development of bacteremia and bacterial colonization during sepsis remains unknown. We hypothesized that mice lacking PI3Kgamma would have improved bacterial control at the site of infection, resulting in reduced bacteremia and bacterial colonization of distal organs.

METHODS. PI3Kgamma wild-type (WT) and knockout (KO) mice were randomized to undergo either cecal-ligation and perforation (CLP)-induced sepsis or a sham laparotomy. After 18 h, plasma, peritoneal and bronchioalveolar lavage (BAL), and tissue of lung, liver, and spleen were collected under sterile conditions. Lung and liver tissues were flushed prior to isolation and tissues were homogenized in sterile saline containing 1 mM EDTA. All samples were serially diluted and plated on soy agar with 5% sheep blood and incubated for 24 h at 37°C, following which CFUs were analyzed.

RESULTS. Sham animals had no bacteria present in any of the collected samples. Following CLP-induced sepsis, wild-type mice had increased bacterial counts in the peritoneal cavity, significant bacteremia and augmented bacterial colonization of the lung tissue, pulmonary alveolar space (BAL), liver and spleen. Although, PI3Kgamma KO mice exposed to CLP showed low amounts of bacteria in the peritoneum and blood, these bacterial levels were significantly lower than WT. Additionally, KO mice show no significant increase in bacterial colonization of the lung, BAL, liver, or spleen.

CONCLUSION. Following CLP, PI3Kgamma KO mice show increased control of peritoneal bacteria, reduced bacteremia and protection against bacterial colonization of distal organs. This suggests that blockade of PI3Kgamma may confer protection against sepsis through improving control of bacterial dissemination.



Bacterial Counts

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0632

DOES AUTOPHAGY CONTRIBUTE TO IMMUNE CELL DEATH AND INFLAMMATION IN SEPSIS?

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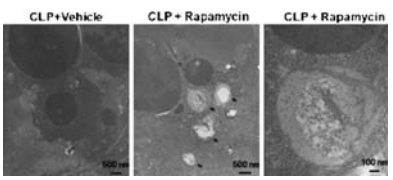
Apoptosis acts as an important mechanism of immunosuppression during sepsis by causing depletion of immune cells and inducing an anti-inflammatory cytokine response. Autophagy, an important host mechanism for removal of intracellular bacteria, has recently emerged as an important mediator of programmed cell death pathways. Autophagy can also regulate antigen presentation and improve T cell immunity. In this study, we examined whether autophagy is involved in immune cell apoptosis and the effects of autophagy activator on apoptotic pathway and inflammatory mediators in sepsis. To assess this, male mice were subjected to cecal ligation and puncture (CLP) or sham operation. Mice received either vehicle, autophagy activator (rapamycin), apoptosis inhibitor (Z-VAD-fmk), or rapamycin in combination with Z-VAD-fmk after onset of CLP. Our results showed autophagy proteins LC3-II and ATG5-ATG12 complex markedly decreased in the spleen at 24 h after CLP. Administration of rapamycin increased in autophagic vacuoles compare to vehicle treated CLP group (Fig. 1). Moreover, administration of rapamycin, Z-VAD-fmk, or rapamycin in combination with z-VAD-fmk significantly upregulated LC3-II and ATG5-ATG12 complex. This upregulation was accompanied by downreulation of active caspase-3 and systemic levels of pro-inflammatory cytokines IL-10 and MCP-1. In stimulated splenocytes, administration of rapamycin or rapamycin in combination with z-VAD-fmk substantially inhibited IL-10 and MCP-1 releases, whilst Z-VAD-fmk alone did not affect IL-10 and MCP-1 releases. These results suggest that upregulation of autophagy reduces splenocyte apoptosis via caspase-3 in sepsis and that decreased apoptotic cells may have an effect on suppressing cytokines IL-10 and MCP-1. Thus, activation of autophagy can be a potential therapeutic strategy in septic patients.



0633

HEME OXYGENASE DURING HUMAN ENDOTOXEMIA

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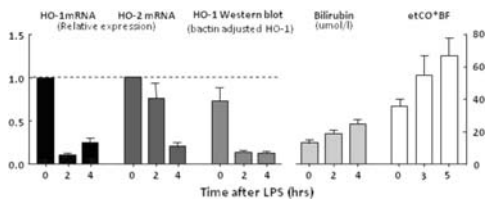
INTRODUCTION. Despite ample research on pathophysiological mechanisms and therapies, sepsis remains the leading cause of death in non-coronary intensive care units. Excessive inflammation, oxidative stress and vascular injury are main contributors to organ dysfunction and are ultimately responsible for the poor outcome. The heme oxygenase (HO) system is considered one of the most potent cytoprotective systems of the human body. The subform HO-1 can be induced by numerous factors including reactive oxygen and nitrogen species, cytokines and lipopolysacchardide whereas HO-2 is constitutively expressed. HO and its end products CO and bilirubin exert anti-inflammatory and anti-oxidative effects in various in vitro and animal models for sepsis and inflammation. However, data concerning the induction and activity during human inflammation are scarse.

OBJECTIVES. The aim of the present study was to determine the induction and kinetics of heme oxygenase and its end products during experimental human endotoxemia.

METHODS. 10 Healthy volunteers received 2 ng/kg of E.coli LPS intravenously. Thereafter, blood was obtained at several time points to determine cytokine production, whole blood HO-1-2 mRNA expression and HO-1 protein content in PBMCs. Also, systemic bilirubin, HbCO saturation in arterial blood and exhaled CO corrected for breath frequency were assessed.

RESULTS. After LPS administration, TNF-α, IL-6 and IL-10 increased from below the detection limit to 1,213 ± 187, 1,521 ± 209 and 73 ± 11 pg/ml, respectively (all: $p < 0.01$). Unexpectedly, expression of HO-1 mRNA decreased 9-fold and HO-1 protein content in PBMCs declined to minimally 17% compared to baseline at 2 and 4 h after LPS ($p < 0.01$). HO-2 mRNA was decreased maximally fivefold at 4 h after LPS ($p < 0.01$). Interestingly, 4 h after LPS infusion, levels of bilirubin increased from 12 ± 2 to 24 ± 3 μmol/l ($p < 0.05$) and, while HbCO concentration in arterial blood did not increase (remained below 1%), CO concentration in exhaled breath times breath frequency increased from 36 ± 4 to 68 ± 11 at 5 h after LPS ($p < 0.05$).

CONCLUSIONS. While HO mRNA and protein levels decline in whole blood and PBMCs during human endotoxemia, its end products bilirubin and CO are increased. This indicates that systemic inflammation during human endotoxemia most likely increases tissue, but not blood, HO levels.



Heme oxygenase during human endotoxemia

0634

SEPSIS INDUCED BY BOTH GRAM NEGATIVE AND GRAM POSITIVE STRAIN'S DETERMINES A RAPID OVERGROWTH OF THE ENTERIC COMMENSAL G- MICROBIOTA AND SUBSEQUENT TRANSLOCATION IN RATS

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Enteric microbiota plays an important role on the gut environment equilibrium and its disruption has been correlated with the local or systemic disease.

OBJECTIVE. Herein we examined the influence of both Gram positive and Gram negative sepsis on aerobic and anaerobic facultative Gram negative (G−) microbiota of the small and large bowel (SB, LB) and their translocation (BT) potentials.

METHODS. Wistar rats (±200 g) were submitted to crescent monobacterial sepsis (S-8 and S-9 groups, with 10^8 and 10^9 CFU/mL/100 g of body weight, respectively, using *S. aureus* (ATCC-29213) or *E. coli* R-6, i.v. inoculation). Samples of duodenum, jejunum, ileum, cecum, feces, mesenteric lymph nodes (MLN), liver and spleen were harvested at 6, 12 and 24 h post-sepsis and cultured in MacConkey agar medium ($n = 6$/period/group). Sham control groups were injected with saline and Naive group, without any procedure, was used to determine the basal gut G− microbiota distribution along the intestine ($n = 6$/period/group).

RESULTS. Expressive gut commensal Gram- overgrowth was seen post-sepsis challenge with both Gram+ and Gram− strains. The G- strain sepsis induced a rapid enteric commensal G− overgrowth and it occurred in a proximal to distal manner, suggesting that the later period LB overgrowth (12 h) were likely due to the earlier SB overgrowth onset (6 h). Besides, the higher sepsis degree (S-9) was followed by higher commensal G− bacterial overgrowth in the SB. The maximum commensal Gram− bacterial overgrowth levels in Naïve and G- strain sepsis S-8 and S-9 were, respectively: duodenum (0.0 vs. 2.8 vs. 4.7 $\log_{10}$); jejunum (2.5 vs. 4.2 vs. 6.0 $\log_{10}$); ileum (4.0 vs. 7.4 vs. 7.5 $\log_{10}$); and cecum (5.1 vs. 8.0 vs. 7.8 $\log_{10}$). With G+ strain sepsis challenge, the commensal G− overgrowth initiated at 6 h and reached the maximum in a later period between 12 and 24 h period post sepsis, in both small and large bowel concurrently. The G+ sepsis overgrowth showed a trend to last for a longer period (up to 24 h period) as compared to G− sepsis (up to 12 h). The maximum levels of the commensal G− overgrowth were in S-8 and S-9, respectively: duodenum (4.2 vs. 3.6); jejunum (5.4 vs. 5.3); ileum (6.4 vs. 6.8); and cecum (9.6 vs. 7.6). The spontaneous BT to MLN occurred following both sepsis: 50% at S-8, 5.6% at S-9 with Gram− strain's sepsis and 30% at S-8 and 0% at S-9 for Gram+ strain's sepsis. All BT events were observed concomitant to the highest overgrowth periods and the recovered strain was only *E. coli* strain.

CONCLUSION. Acute sepsis states provoked by both Gram− and Gram+ strains induced a significant and transient SB and LB commensal G− microbiota overgrowth with potentials to promote BT within first 24 h post sepsis. Nevertheless, Gram− strain's sepsis-dependent overgrowth showed a trend to occur in an earlier period as compared to Gram+ sepsis and suggested to have higher BT potentials.

0635

THE SENSITIVITY OF THE MESENTERIC VASCULAR BED AND THE INTESTINAL BARRIER TO PLATELET ACTIVATING FACTOR PAF IN THE ISOLATED PERFUSED RAT SMALL BOWEL

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INTRODUCTION/OBJECTIVES. Platelet activating factor (PAF), an endogeneous mediator of inflammation, provokes epithelial barrier dysfunction, septic shock and multiple organ failure. Over the past years, the pharmacodynamics and inflammatory pathways of PAF were decrypted, e.g. in the lungs by use of isolated perfused organs improving our understanding of pulmonary oedema formation. Surprisingly, the research has not focused to the same extent on another important barrier organ, the intestine. We used a recently developed isolated organ model of the rat small bowel [1] to identify the dose response relationships of PAF in the intestine.

METHODS. Small intestines were dissected from 12 anaesthetized adult female Wistar rats and perfused vascularly (7.5 ml min^{-1}) and luminally (0.15 ml min^{-1}) in a warm humidified chamber. After equilibration different amounts of PAF (0.5, 5, 50, 150, 500 and 1,500 pmol) were applied by bolus administration via the mesenteric artery. In one of the experiments, a specific PAF receptor antagonist ABT-491 was continuously applied to the vascular buffer. Arterial, venous and luminal pressures as well as venous, luminal and lymphatic effluent flows were recorded continuously. The transfer of the macromolecule FITC dextrane from the vasculature to the lumen and lymphatics was measured every 15 min. All reference parameters of the intestine stability and viability were recorded as described before [1].

RESULTS. PAF administration in increasing concentrations from 0.5 to 1,500 pmol resulted in its typical transitory effects like vasoconstriction (Δ P_{max} from 1.9 to 32 mmHg), loss of vascular fluid [from 0.8 to 27.6 ml $(10\ min)^{-1}$] and transfer of FITC dextrane from the mesenteric vascular bed to the luminal fluid [from 1.7 to 373 μg $(15\ min)^{-1}$] and the lymph [from 6.4 to 191 μg·$(15\ min)^{-1}$]. The dose response curves of the normalized data displayed the typical sigmoid characteristics indicating a specific ligand receptor interaction. The half maximal effective dose (ED 50) of PAF for the increase of vascular resistance (55.4 pmol) and the parameters of permeability (157.4 pmol) differed significantly, while the slope factor of the curves was equal. The administration of ABT-491 abolished the effects of PAF.

CONCLUSIONS. The responses of the mesenteric vascular bed and the intestinal barrier to PAF were mediated by a specific PAF receptor and were dose dependent. The ED 50 of PAF leading to intestinal hyperpermeability was threefold higher than the ED 50 needed to evoke mesenteric vasoconstriction, indicating varying sensitivities to PAF. Mediation via different and possibly not yet defined second messengers could explain these differences. Further studies using specific antagonists of the well known mediators linked to PAF like leukotrienes, thromboxane, ceramide and PGE_2 may clarify their role in the mediation of the detrimental intestinal effects of PAF.

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0636

MITOCHONDRIAL BIOGENESIS RESPONSE IS ASSOCIATED WITH POSITIVE OUTCOME IN CRITICALLY ILL PATIENTS

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BACKGROUND. Mitochondrial dysfunction in muscle and compromised cellular energetic status are associated with mortality in septic patients [1]. Mitochondrial function depends on the balance between expression and assembly of proteins (biogenesis) and their inactivation/degradation (e.g. due to oxidative/nitrosative stress). Since mitochondrial biogenesis is associated with recovery of organ function in an animal model of sepsis [3], we have investigated mitochondrial biogenesis and markers of oxidative stress in critically ill patients.

METHODS. With ethics approval and appropriate consents, critically ill patients were recruited within 24 h of ICU admission. Age-matched control patients were undergoing elective hip surgery. Muscle biopsies were taken from vastus lateralis. Mitochondrial enzyme activities were determined [1] and proteins extracted for immunoblotting. RNA was purified, reverse transcribed and (a) microarray analysis was performed by hybridisation to Human-6 v2 Expression BeadChip (http://www.illumina.com/pages.ilmn?ID=197) or (b) quantitative PCR performed. Data were analysed for significance using one-way ANOVA (vs. control).

RESULTS. A total of 10 controls (Ctrl), 10 eventual survivors (Svr) and 6 eventual non-survivors (NSvr) were analysed:

(a) transcript levels for markers of biogenesis PGC1-alpha and NRF-1 were elevated in Svr ($p = 0.003$) but not NSvr;
(b) respiratory complex subunit transcripts showed an overall decrease in NSvr, but were maintained in Svr group;
(c) decreased respiratory protein subunits for complex IV ($p < 0.05$ Svr and Nsvr) and trend for complex I;
(d) markers of oxidative damage: elevated (3-fold) mitochondrial MnSOD in Svr ($p = 0.01$), not in NSvr ($p = 0.87$); cytosolic GPX marginally decreased in both patient groups ($p = 0.05$);
(e) serum IL-6 levels: 100-fold rise in Svr, 4,000-fold rise in NSvr ($p = 0.05$).

CONCLUSION. An early biogenesis response contributes to maintenance of mitochondrial functional capacity and a mitochondrial oxidative stress response in patients who went on to survive. Failure to mount these responses may contribute to cellular energetic dysfunction and mortality. Lack of clear correlation between IL-6 and PGC1a suggests that factors other than severity of inflammation may play a significant role in determining the extent of mitochondrial biogenesis in critical illness.

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0637

PATIENTS WITH TYPE 2 DIABETES EXHIBIT AN ATTENUATED ADHESION MOLECULE RESPONSE DURING EXPERIMENTAL ENDOTOXEMIA

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Type 2 diabetes (T2D) is associated with an increased risk of infection[1]. The mechanisms underlying this remain unclear, although in vitro studies indicate that it may involve aberrations in neutrophil function [1]. Upregulation of ICAM, VCAM and E-selectin during infections are crucial to neutrophil migration during the inflammatory response. We therefore hypothesized that patients with T2D exhibit an impaired response of these adhesion molecules during a standardised inflammatory stimulus.

After ethical approval, a thorough physical examination and informed consent, 16 healthy men and 16 men with type 2 diabetes were given an endotoxin injection (0.3 ng/kg). Measurements of temperature, neutrophils, ICAM and VCAM, and soluble E-selectin in plasma were done hourly from baseline until 8 h after endotoxin. Data was analysed by two-way ANOVA for longitudinal measurements with Dunnet-adjusted post hoc *t* tests.

A marked inflammatory response with increases in temperature and neutrocyte counts was triggered by LPS, but with no difference between groups. Plasma ICAM and VCAM increased after LPS ($P < 0.0001$ for both), but the response was attenuated in subjects with T2D ($P < 0.05$ for both). E-selectin increased after LPS ($P < 0.0001$), with no difference between groups ($P = 0.07$).

In conclusion, we found an attenuated ICAM and VCAM response after endotoxin injection in T2D. We speculate that this may contribute to the increased risk of infection in T2D.

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0638

SINGLE ACUTE BACTERIAL TRANSLOCATION (BT) CHALLENGE INDUCES A LASTING GUT ASSOCIATED LYMPHOID TISSUE CROSSTALK WITH SYSTEMIC IMMUNITY PROVOKING SPLANCHNIC TISSUE HYPOPERFUSION IN RATS

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Growing evidences have pointed out the role of the gut immunity in the worsening of the critical illness, such as in sepsis, by provoking systemic inflammatory response aggravation. Herein we evaluated BT-related microcirculation and gut immune changes up to 14 days following single acute BT-challenge.

METHODS. Wistar rats ($n = 162$) were submitted to 2 h BT by oroduodenal bacterial inoculation and confinement in small bowel (10 mL of *E. coli* 10^{10}CFU/mL) and were compared to Sham (saline injection) group. At 2, 6, 24, 72 h, 7 and 14 days, animals were monitored for BT-index (mesenteric lymph nodes, spleen and liver by culture), intravital mesenteric bed microscopy, Doppler tissue perfusion (jejunum, ileum, liver and kidneys) and cellular and humoral components of the mesenteric lymph by lymphgram, flow cytometry and IL-6, IL-10 and INF-g by CBA-Flex assay.

RESULTS. Bacterial recovery was only positive in BT-group with peak at 6 h which became 100% negative at day 7. Significant BT-related tissue hypoperfusion was seen in all organs ($p = 0.0039$*) at 2 and 24 h associated with progressive microcirculation injuries. Trafficking mesenteric efferent lymph cell count was significantly increased at 2, 6, 24 h and 14 days, although cell composition remained similar to Sham (95% lymphocytes, 5% others) at all periods. Besides, the lymph $Tcd3^+$ predominated over the B cells ($cd45RA^+$, 83% to 12%); and within T-cells, $Td4^+$ was higher than $Tcd8^+$ (75 vs. 15%) in all periods, but was similar between groups. Naive cells ($cd45RC^+$) predominated in $Tcd4^+$(55%) and $Tcd8^+$(75%) population. Memory cells ($cd45RC^-$) was 45% in $Tcd4^+$ and 25% in $Tcd8^+$, and the activated cells ($cd25^+$) were 15% in $Tcd4^+$ and 5% in the $Tcd8^+$ in all periods, and also did not differ between groups. However, when the above findings were converted in proportion to the number of trafficking lymph cells, BT group's lymph showed a significantly different state of immune activation as compared to respective sham-groups. Blood leucocytes remained unchanged at all groups. Besides, the BT-process provoked significant IL-6 increase at 2 and 24 h, which correlated to the periods of high bacterial recovery and tissue hypoperfusion. IFN-g and IL-10 remained similar between groups on 2, 6, 24 and 72 h periods. After 72 h all cytokines returned to normal level.

CONCLUSION. Acute and single episode of BT-event determined prolonged BT with systemic hypoperfusion and microcirculation injuries which lasted for first 3 days. The BT-related gut-associated-lymphoid-tissue activation with cellular and cytokine profile changes in the lymph demonstrated the role of the lymphatic BT-route in the generation of the immune crosstalk between gut and systemic compartments.

0639

SIMULTANEOUS ASSESSMENT OF RENAL MICROVASCULAR AND INTERSTITIAL OXYGEN TENSION DURING ENDOTOXAEMIA

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INTRODUCTION. Dual-wavelength phosphorimetry and tissue oxygen tension monitoring are two methods capable of determining the partial pressure of oxygen in the microvasculature and interstitium, respectively. These techniques also allow oxygen pressure measurements to be determined in different anatomical compartments of the same organ, such as the renal cortex and medulla [1, 2].

OBJECTIVES. To simultaneously assess of microvascular (μPO_2) and tissue (tPO_2) oxygenation in the renal cortex and medulla during endotoxaemia.

METHODS. Anaesthetised and mechanically ventilated male Wistar rats (300 g) breathing 40% O_2 underwent arterial (left common carotid) and venous (right jugular) cannulation to allow BP monitoring and blood sampling, and fluid and LPS administration, respectively. Macrovascular blood flow in the left renal artery (RBF) was monitored by ultrasonic flow probes (Transonic Systems, USA). Tissue PO_2 was determined using Oxylite probes (Oxford Optronix, UK) placed in the left renal cortex and medulla to a depth of 0.5 and 2 mm, respectively. Oxyphor G2 (6 mg/kg) was infused IV and cortical and medullary μPO_2 assessed using dual-wavelength phosphorimetry. After a 30-min stabilisation period, rats ($n = 5$/group) were subjected to IV LPS (2.5 mg/kg over 15 min) or vehicle (Hartmann's solution) and fluid resuscitated throughout (20 ml/kg per hour). Arterial blood was taken at the end of each experiment to determine base excess (ABE). Statistics were performed using two-way RM-ANOVA and post hoc Tukey's test.

RESULTS. Data shown as mean (±SE), *$p< 0.05$ between sham and LPS. Timepoints chosen to reflect the biphasic response to LPS: 0 = baseline, 15 = initial hypotensive phase, 60 = maximal recovery, 240 = end of experiment.

CONCLUSION. In this short-term, fluid resuscitated, severe model of endotoxic sepsis, temporal changes in BP and renal macrovascular blood flow were observed. Renal cortical microvascular and tissue oxygenation was initially maintained but gradually decreased over the course of the experiment. By contrast, medullary microvascular and tissue oxygenation decreased in both phases of endotoxaemia; this was particularly pronounced in the interstitium. These data support the concept that intrarenal blood flow redistribution occurs during early sepsis, resulting in medullary hypoxia. In late sepsis, however, both cortical and medullary hypoxia was observed (Table 1)

TABLE 1

Time (mins)	BP (mmHg)	RBF (ml/min)	Medulla μPO_2 (kPa)	Cortex μPO_2 (kPa)	Medulla tPO_2 (kPa)	Cortex tPO_2 (kPa)	ABE (mmol/l)
Sham							
0	102 (6)	4.8 (0.7)	7.2 (0.4)	9.6 (0.5)	2.2 (0.3)	5.3 (0.5)	
15	102 (7)	4.7 (0.7)	7.1 (0.4)	9.5 (0.4)	2.7 (0.3)	5.5 (0.5)	
60	98 (7)	5.2 (0.6)	6.9 (0.4)	9.6 (0.7)	3.4 (0.2)	5.1 (0.6)	
240	92 (9)	5.9 (1.4)	6.8 (0.6)	8.2 (0.4)	3.1 (0.2)	5.7 (1.0)	−3.5 (0.7)
LPS							
0	99 (6)	4.5 (0.6)	6.9 (0.2)	9.2 (0.5)	2.4 (0.1)	4.9 (0.2)	
15	42 (7)*	1.8 (0.2)*	4.9 (0.4)*	9.0 (0.9)	0.8 (0.2)*	4.5 (0.8)	
60	72 (6)	3.5 (0.9)	6.7 (0.4)	8.2 (0.5)	1.2 (0.2)*	3.9 (0.8)	
240	38 (3)*	1.9 (0.6)*	3.6 (0.6)*	4.3 (0.4)*	0.6 (0.2)*	2.5 (0.7)*	−11.3 (0.8)*

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PLATELET MITOCHONDRIAL MEMBRANE POTENTIAL MAY BE ALTERED DURING HUMAN SEPSIS

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INTRODUCTION. Mitochondrial dysfunction may play a pivotal role in the pathogenesis of sepsis [1]. When damaged, mitochondria lose their physiological polarization, that is, their negative membrane potential ($\Delta\psi_m$).

OBJECTIVES. To study human platelet $\Delta\psi_m$ during sepsis.

METHODS. Platelets were taken from 16 severely septic or septic shock patients within 24 h from admission to the Intensive Care Unit and 6 healthy volunteers. After staining with JC-1, platelet $\Delta\psi_m$ was measured by flow citometry and expressed as the ratio between normally polarized (FL2) and abnormally depolarized (FL1) organelles [2]. In septic patients, the severity of illness at the time of the study was evaluated according to the Sepsis-related Organ Failure Assessment (SOFA) score, with higher values indicating a higher degree of morbidity [3]. Data are presented as mean ± standard deviation.

RESULTS. Overall, platelet $\Delta\psi_m$ (expressed as FL2/FL1) did not differ between septic patients and healthy volunteers (2.5 ± 1.3 vs. 3.4 ± 0.3; $p = 0.11$—Student's t-test). In septic patients, platelet $\Delta\psi_m$ was inversely associated with the SOFA score (R^2 0.27; $p = 0.04$—linear regression), with the lowest values recorded in the most severely ill subjects. Platelets taken from patients with a SOFA score above the group median value (>9, $n = 7$) had a $\Delta\psi_m$ significantly lower than those taken from less severely ill patients (SOFA score ≤9, $n = 9$) and healthy volunteers (1.6 ± 0.6 vs. 3.2 ± 1.4 vs. 3.4 ± 0.3; $p = 0.01$—one way analysis of variance).

CONCLUSIONS. These preliminary data suggest that platelet mitochondrial membrane potential may be altered in the most severely ill septic patients.

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Genomics and proteomics: 0641–0654

0641

GENOTYPING OF HLA-DR SHOWS THAT HLA-DRB3 HOMOZYGOSY IS ASSOCIATED TO SEVERITY IN SEVERE SEPSIS AND SEPTIC SHOCK

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INTRODUCTION. Major histocompatibility complex class II includes highly polymorphic genes which have been associated with various inflammatory diseases and infection susceptibility. Among these genes, HLA-DRB genes encode for co-expressed proteins of HLA-DR molecule to present antigen to T lymphocyte. HLA-DRB1 gene is constitutive, but additional gene (HLA-DRB3, DRB4 or DRB5) defines variant haplogroups and results in higher amount of HLA-DR molecule at cell surface. The decrease in monocyte HLA-DR expression was proposed as a prognosis marker in sepsis.

OBJECTIVES. To study the association: between HLA-DRB polymorphism and

1. prognosis,
2. monocyte HLA-DR expression, and
3. organ failure severity in sepsis.

METHODS. HLA-DRB genes have been studied in 187 septic patients with at least 2 organ failures (78% septic shock). Genomic DNA extraction: salting-out technique from fresh peripheral blood leucocytes. Genotyping of 13 alleles of HLA-DRB1 (generic typing): high resolution DNA based typing (allelic level) using the PCR-Sequence Specific Primers (PCR-SSP) amplifications. Presence of second gene was deduced from their known association with HLA-DRB1 alleles: HLA-B3 with HLA-DRB1 (*03,*11,*12,*13,*14); HLA-DRB4 with HLA-DRB1 (*04,*07,*09); HLA-DRB5 with HLA-DRB1 (*15, *16). Monocyte HLA-DR expression at D0 by flow cytometry. Statistics: Chi^2 of Pearson. Results as median (25–75 percentiles).

RESULTS. 64% males, age: 63 y.o. (18–94), SAPSII 46 (37–57), SOFA 8 (6–11). Mortality rate 26% at D7, 38% at D28. 87% Caucasian, 8% African, 2% Asian. Frequencies: 70% HLA-DRB3, 49% HLA-DRB4, 24% HLA-DRB5. No association between HLA-DRB1 alleles and prognosis or HLA-DR expression level. Presence of a second gene, homozygote or heterozygote, was not associated with outcome but with negative blood culture ($p < 0.05$). Homozygosy for the second gene, especially HLA-DRB3 (23%) presented less organ dysfunction: 21% with SOFA < 8 compared to 48% heterozygotes ($p < 0.003$).

CONCLUSION. In severe sepsis, HLA-DRB polymorphism was not associated with prognosis. HLA-DRB3 homozygosy was associated with less organ dysfunction. HLA-DRB genotyping may help to define patients with high risk of death.

0642

MUSCLE TRANSCRIPTOME IN PATIENTS WITH MULTIPLE ORGAN FAILURE

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Muscle wasting and weakness are characteristic problems in ICU patients suffering from MOF and are well known to negatively affect morbidity and mortality. The aim of this study was to for the first time assess changes in gene expression in muscle of patients with MOF to elucidate new molecular mechanism.

Thirteen patients treated in the ICU for MOF and 8 healthy, age and sex matched, control subjects undergoing elective surgery were included. Muscle biopsies were obtained using a Bergstrom needle. RNA was extracted using TRIzol and gene expression assessed using the Affymetrix U133+2 array platform. Data were quality controlled using the Microarray Suite software (MAS 5.0). All array data were normalized through implementations of the MAS5 algorithm, to a global scaling intensity of 100. The normalized data were analyzed with the Significance Analysis of Microarray (SAM, http://www-stat.stanford.edu/~tibs/SAM/). SAM provides a list of ''significant'' genes and attempts to estimate of the false discovery rate (FDR), which represents the percentage of genes that could be identified by chance. SAM assign a score to each gene/probe set as an index of relative difference between groups. For the data presented, genes were considered significantly changed in ICU patients, when a delta value corresponding to the number of false significant genes of 5% (q-value), and an average fold change of 2, was achieved.

All array analyses passed the quality control and were used in the final analyses. Expression of 1,457 genes was significantly increased ($p < 0.05$), whereas expression of 525 genes was significantly decreased ($p < 0.05$) in muscle of the MOF patients. In two recent publications, genes typically increased or decreased in their expression in several animal models with muscle wasting (atrophy) and disuse were identified [1, 2]. These genes were defined as atrogenes. When data from our patients were compared with these atrogenes, good agreement was obtained for the atrophy specific genes involved in protein degradation, translation and extracellular matrix proteins, but less for those involved in energy metabolism. When compared with the genes specific for disuse, very little agreement was seen.

Overall analysis of the transcriptome of skeletal muscle in patients with MOF shows a large number of genes with increased expression. For the first time we show that the loss of muscle mass and function is accompanied by an activation of the genome rather than an expected down-regulation. Compared with animal models of disuse the pattern of gene expression suggests that disuse is not involved in the wasting of muscle in MOF patients to a large extent.

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0643

GENOMIC VARIATIONS WITHIN MATRIX METALLOPROTEINASE-9 ARE NOT ASSOCIATED WITH SEVERE SEPSIS IN HAN CHINESES

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AIMS. Sepsis is a multiple genes disease resulting from the interaction of enviromental and genetic components. Genomic variations within candidate genes participating in the pathophysiology of sepsis may impact the clinical course of sepsis. Matrix Metalloproteinase-9 (MMP-9) has been demonstrated to play an important role in organ dysfunction and outcome of sepsis. However, genetic predisposition of MMP-9 to sepsis remained unknown.

METHODS. The present study investigated common single nucleotide polymorphisms (SNPs) within the functional regions of MMP-9 gene (rs17576, rs2274756, rs2250889, rs9509, rs3918240, rs3918241 and rs3918242) in 192 patients with severe sepsis and 262 healthy controls by means of direct sequencing or polymerase chain reaction-restriction fragment length polymorphism. Meanwhile, the plasma levels of MMP-9 were measured in 32 patients with severe sepsis and 19 healthy controls via enzyme linked immunosorbent assay.

RESULTS. The genotype distributions and allelic frequencies of above 7 SNPs were not significantly different between patients with severe sepsis and controls, as well as surviving and non-surviving patients with severe sepsis (all $p < 0.05$). Haplotype GGCTTTC, AGGTCTC, GGCCTTC, GACTTAT and AGCCCTC are the five most common haplotypes. The distributions of the haplotypes also showed comparable between the defined groups. The median plasma levels of MMP-9 was 37.66 ng/ml (interquartile range [IQR] 21.89–81.34 ng/ml) in 32 patients within 24 h after diagnosis of severe sepsis, and 30.15 ng/ml (IQR 18.85–53.11 ng/ml) in 19 healthy controls. Compared to those in surviving patients with severe sepsis (median 37.66 ng/ml, IQR 17.78–52.49 ng/ml, $n = 16$) and healthy controls, the concentrations of MMP-9 appeared an increasing trend in non-surviving patients with severe sepsis (median 36.06 ng/ml, IQR 23.49–107.60 ng/ml, $n = 16$).

CONCLUSIONS. The present findings suggest that common polymorphisms within the function regions of MMP-9 gene may not play a major role in the predisposition to severe sepsis in Chinese Han cohort. The plasma levels of MMP-9 may associate with the outcome of severe sepsis. Further studies in large samples need be guaranteed.

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0644

AA GENOTYPE OF *B2*-ADRENERGIC RECEPTOR GENE POLYMORPHISM RS1042717 IS ASSOCIATED WITH INCREASED MORTALITY IN SEPTIC SHOCK

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INTRODUCTION. The β2-adrenergic receptor gene (ADRB2) plays a key role in outcome and response to adrenergic agonists in cardiovascular diseases and respiratory/inflammatory diseases, including heart failure and asthma. The CysGlyGln haplotype of three functional ADRB2 (Cys/Arg-19, Gly/Arg16, Gln/Glu27) single nucleotide polymorphisms (SNPs) is functionally important and associated with outcome in response to adrenergic agonists in asthmatic patients. Adrenergic agonists form a cornerstone of cardiovascular management of septic shock and are associated with anti-inflammatory effect. Polymorphisms of a variety of genes, including cytokines and crucial molecules in innate immune and coagulation system are related to altered outcome in septic shock. Despite the known functional polymorphisms within ADRB2, whether this functional haplotype alters outcome in patients receiving adrenergic agonists in septic shock is unknown.

OBJECTIVES. To determine whether genetic variation of ADRB2 influences outcome of septic shock.

METHODS. Two cohorts of septic shock patients on admission were studied: a single center (St. Paul's Hospital, SPH) cohort ($n = 589$) and the Vasopressin and Septic Shock Trial (VASST) cohort ($n = 616$). The A allele of the rs1042717 G/A polymorphism is in complete linkage disequilibrium with the CysGlyGln haplotype of ADRB2. Therefore rs1042717 was genotyped. Differences in hazard of death over 28 days by rs1042717 genotype were analyzed as a primary outcome with the use of Cox regression. To evaluate differences in response to adrenergic agonists by rs1042717 genotype, norepinephrine- and salbutamol-induced inhibition of IL-6 production under mixed inflammatory simulation in lymphoblastoid cell lines of known ADRB2 rs1042717 genotype were assessed.

RESULTS. Patients who had the AA genotype of rs1042717 had increased 28-day mortality in SPH (adjusted hazard ratio 2.23, 95% CI 1.33–3.72, $P = 0.0022$) and this result replicated in VASST (adjusted hazard ratio 2.82, 95% CI 1.56–5.09, $P = 0.0006$). This genotypic effect was eliminated in those patients treated with corticosteroids. In all patients the AA genotype was also associated with more organ dysfunction. Patients who had the AA genotype had a higher heart rate (SPH, $P < 0.05$; VASST, $P < 0.05$) and a higher day 1–3 norepinephrine dose (VASST, $P < 0.05$). AA genotype was associated with decreased norepinephrine and salbutamol inhibition of IL-6 production by stimulated lymphoblastoid cells in vitro ($P < 0.05$).

CONCLUSION. AA genotype of the ADRB2 rs1042717 polymorphism, marking homozygotes for the known functional CysGlyGln haplotype, was associated with increased 28-day mortality, more organ failure, higher heart rate during initial 5 days, and higher norepinephrine infusion rates in patients who had septic shock. The same genotype had reduced anti-inflammatory effects when norepinephrine and salbutamol inhibited IL-6 production by stimulated lymphoblastoid cells in vitro.

0645

APOPTOSIS MARKERS BIM AND BCL2 MRNA TRANSCRIPTION IN PERIPHERAL BLOOD MONONUCLEAR CELLS CAN DISTINGUISH BETWEEN THE HUMAN HOST RESPONSE IN INFECTION AND SEPSIS

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INTRODUCTION. Apoptotic death of immune effector cells including lymphocytes may play an important role in the pathological process of sepsis [1]. Autopsy studies of adults who died of sepsis showed profound apoptosis-induced depletion of CD4+Tcells [2]. Apoptosis markers such as BIM, BCL-2 and BAX have been shown to be significant in animal models of infection [3, 4].

OBJECTIVES. We investigated the mRNA transcription of these markers in the human model of infection and sepsis

METHODS. A prospective observational study. Mononuclear cells were isolated from three groups. 52 patients with severe sepsis, 15 patients with Gram-negative bacteraemia, but no organ failure and 10 healthy controls.Total RNA was extracted. BIM, BAX and BCL-2 mRNA was quantified using the technique of quantitative real-time polymerase chain reaction (qRT-PCR). All values are stated as median and inter-quartile range. Between group comparisons was performed by Wilcoxon rank sum test.

RESULTS. BAX mRNA copy numbers were not significantly different between the three study groups, Control (6.899×10^6; 6.91×10^6–6.55×10^6); bacteraemic (6.69×10^6; 6.78×10^6–6.63×10^6) and sepsis (6.71×10^6; 6.91×10^6–6.55×10^6) ns. BCL-2 mRNA copy numbers was significantly reduced in the sepsis group (3.96×10^6; 4.17×10^6–3.55×10^6) compared to the bacteraemic group (4.42×10^6; 4.57×10^6–4.29×10^6) and the controls (4.42×10^6; 4.83×10^6–3.82×10^6) $p < 0.0001$. BIM mRNA copy numbers were significantly increased in sepsis group (3.24×10^6; 3.36×10^6–3.06×10^6) compared with bacteraemic (2.93×10^6; 3.05×10^6–2.77×10^6) and control group (2.75×10^6; 3.07×10^6–2.67×10^6) $p = 0.0003$.

CONCLUSION. Apoptosis may play a role in the human response to infection. Whilst it has been well characterised in animal models, Bim, a pro-apoptotic member of the BCL-2 family, neutralises anti-apoptotic members of the BCL-2 family. It is not therefore surprising to find an increase in Bim mRNA transcription is associated with a decrease in the mRNA transcription of BCL-2, an anti-apoptotic factor. This is further evidence apoptotic death of mononuclear cells may play a role in the human response to infection.

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0646

GENE ASSOCIATION NETWORK AS SIGNATURE FOR PROGNOSIS IN SEPTIC SHOCK

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INTRODUCTION. No suitable early biological markers have been shown to predict outcome in human septic shock. A rapid blood test would help to characterize patients with high risk of death and might help for therapeutic strategy, particularly for use of high-tech drugs. Circulating immune cells may contain inflammatory messages to remote organs.

OBJECTIVES. To study if the association and interactions of genes expressed by these cells may have a signature for outcome in septic shock.

METHODS. Multicentric study (4 ICUs), 48 patients included at D0 of septic shock with at least 2 organ failure, SAPSII 59 (15) [median (IQR)], SOFA 10 (14). Gene expression analysis in blood immune cells (PMN removed by centrifugation gradient) by microarray (HG-U133 Plus 2.0, Affymetrix®). Gene of interest selection from differential analysis for D28 mortality (*t* test), with fold change >1.5 and *p* value <0.1. Partial Least Squares Regression-based partial correlation (PLSPC) applied to survivors and non-survivors separately and analysis of the obtained networks in a global point of view. PLSPC uses exclusively our microarray data and does not use any *apriori* knowledge to construct the gene regulation networks.

RESULTS. 229 genes were differentially expressed for prognosis. Globally, gene-to-gene connexions were fewer in non-survivors: 204 connexions (0.7% of possibilities) compared to 512 (1.2% of possibilities) in survivors. HLA-DRB4 gene has a central position was the most connected gene in both networks with 12% of connexions in non-survivors (24 genes) and survivors (63 genes). Only 4 connexions of HLA-DRB4 were similar in survivors and non-survivors.

CONCLUSION. The number and type of interactions between genes may constitute a signature for prognosis. HLA-DRB4 expression seemed to have a key position among the genes differentially expressed at D0 according to D28 outcome.

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0647

ACTIVATED PROTEIN C AND GENE POLYMORPHISM IN SEVERE SEPSIS

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INTRODUCTION. The clotting factor recombinant human activated Proteinc C (APC) has been shown to reduce mortality in septic patients, even though the mechanism is still under discussion. The aim of the study is to relate the anticoagulation activity with clinical parameters in these patients.

OBJECTIVES. Patients with severe sepsis or septic shock to assess clinical response, cellular-damage parameters, resistance to APC, the relation with Factor V Gene and hospital mortality adjusted to time variables and therapeutic treatment based on SSC guidelines.

METHOD. Cohort study of 38 critically ill ICU patients >18 years with a first-time admission in a university hospital with severe sepsis or septic shock. Inclusion criteria: severe sepsis or septic shock <24 h defined according to the SSC criteria. Age, sex, previous pathology, sources of infection, coagulation and inflammatory markers during the first 24 h were studied. For screening of resistance of APC, we use Dade Behring's coagulation Proc Ac R test with BCR's analyzer, based on activation of the protein C endogenous for incubation of plasma with the poison of Russell's snake and posterior determination of the relationship of the time of activation with and without the activator of the poison of the snake. The activation and amplification of factor V DNA to the tarjeted patients will be done with the equipment Light cycle of Roche laboratories by means of the PCR in time real by probes FRET (Fluorescent Resonance Energy Transfer) and later we will identify possible mutations or gene poliformism of this tarjet DNA by means of an analysis of curves of merger.

RESULTS. We analyzed 38 consecutive episodes of severe sepsis (16%) or septic shock (84%) admitted in the UCI. Age: 57 ± 17.1 years; female: 56.8%. The beginning of the sepsis took place in emergency area in 42% of the cases. The main sources of infection were: lung 39.5% and abdomen 26%. 63% had medical pathology and 37% received treatment with rhAPC. ICU mortality was 21%. The profile of death patients were women in a major percentage (66%, $n = 9$), average is higher (63 vs. 56 years), as well as the score of clinical severity, the APACHE II (26 vs. 21, $p = 0.02$) and SOFA (12.8 vs. 9, $p = 0.001$), with major dysfunction organs (4.8 vs. 4.2).

We observed major consumption of protein C (46 vs. 85, $p = 0.003$) and antitrombin III (48 vs. 80, $p = 0.001$) in these patients. A whole of 38% ($n = 14$) received treatment with rhAPC (28%, $n = 4$ in the deceased vs. 71%, $n = 10$ in the survivors). 12% ($n = 4$) of these treated patients presented resistance to the Protein C activated and only one of them had heterozygotic Factor V Leiden.

CONCLUSIONS. Preliminary results from this cohort study showed an improvement in the survival in septic patients under a less consume of protein C. Our data found a scarce percetange of patients with resistance to APC, due to genetic polymorphism of factor V Leiden (25% of the cases). Futher research in prospective studies is needed.

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MATRIX-METALLOPROTEINASES 2, 8 AND 9 IN SEVERE SEPSIS—A PROSPECTIVE LONGITUDINAL STUDY OF 44 PATIENTS

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BACKGROUND. In addition to their role in remodeling the extracellular matrix the matrix metalloproteinases (MMP) have various functions in inflammation and immune response.

PURPOSE. We measured the levels of MMP-2, MMP-8 and MMP-9 in serum and skin suction blister fluid in order to examine the levels during and after severe sepsis.

MATERIALS AND METHODS. Forty-four patients with severe sepsis and fifteen healthy controls were enrolled in this prospective longitudinal study. MMP-2, MMP-8 and MMP-9 were analyzed from serum on study days 1, 4, 6, 8 and 10 and from skin suction blister fluid on days 1 and 5. Additively samples were obtained after three and 6 months from the survivors.

RESULTS. In blister fluid MMP-8 was elevated in sepsis on days 1 and 5. Pro MMP-2 was slightly elevated, and the active form was found only in patients with severe sepsis, but not in controls. Pro MMP-9 was not increased, but again the active form was found only in severe sepsis. In serum samples, MMP-8 was elevated in severe sepsis compared to controls and the values had normalized at 3 and 6 months. MMP-2 was elevated until day 6 in sepsis compared to controls. MMP-9 levels did not change in sepsis. In non-survivors the serum levels of MMP-8, MMP-2 and MMP-9 were higher in survivors

CONCLUSIONS. Matrix metalloproteinases are elevated in serum and blister fluid in severe sepsis. Furthermore the levels are higher in non-survivors. These results imply that matrix metalloproteinases play a significant role in the pathogenesis of severe sepsis.

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KINETICS OF THE IMMUNOMODULATORY PROPERTIES OF ANTIBIOTICS ON THE INNATE IMMUNITY DURING SEPSIS

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AIMS. The innate immune system is a crucial factor in the pathogenesis of sepsis. Beside their anti-infective efficacy, several antibiotics are able to alter the innate immunity towards pro- or anti-inflammatory response. Some antibiotics have been identified to regulate the expression of Toll-like receptors (TLRs) and cytokines. However, nothing is known about the chronological order. The aim of this study was to investigate the kinetics of the immunomodulatory antibiotic moxifloxacine (MXF) on the expression of TLRs and proinflammatory cytokines in an in vitro sepsis model.

METHODS. The monocytic cell line THP-1 was cultivated for 48 h in antibiotic free medium. Thereafter, the cells were stimulated in three groups by either lipopolysaccharide (LPS), MXF, the combination of LPS and MXF or phosphate buffered saline (PBS) as control. The cells were harvested after 2, 6 and 24 h. The quantitative expression of TLR1, TLR2, TLR4 and TLR6 was measured with real-time PCR after 2 and 6 h. The cytokines TNF-α and IL-1β were quantified from the supernatant by ELISA after 2, 6 and 24 h. Statistical analyses were evaluated using Kruskal–Wallis Test followed by Dunnett's test. P values <0.05 were considered to be significant.

RESULTS. MXF regulated differentially the expression of TLR 1: After 2 h, TLR1 was significantly upregulated by MXF alone (1.38 $\pm$ 0.09 AU) and in combination with LPS (1.46 $\pm$ 0.2 AU) compared to LPS group (0.71 $\pm$ 0.09 AU). Over the course of 6 h, MXF abrogated the higher mRNA levels of TLR1 by LPS stimulation (2.55 $\pm$ 0.39 AU vs. 0.96 $\pm$ 0.28 AU). Corresponding to TLR1, the expression of TLR6 was also significant upregulated in the MXF + LPS group after 2 h [1.71 $\pm$ 0.33 AU vs. 1.15 $\pm$ 0.11 AU (PBS) and 1.043 $\pm$ 0.18 AU (LPS)]. However, the expression of TLR2 and TLR4 was neither influenced by MXF nor modified MXF the upregulation of TLR2 by LPS [1.51 $\pm$ 0.37 Arbitrary Units (AU) vs. 1.42 $\pm$ 0.10 AU]. The production of TNF-α after LPS treatment was strongly suppressed by the costimmulation with MXF in the first 2 h (1,049 $\pm$ 148.2 pg/ml vs. 316.1 $\pm$ 110.7 pg/ml) and remained significantly reduced after 24 h (891.3 $\pm$ 76.41 pg/ml vs. 638.4 $\pm$ 87.66 pg/ml). In addition, IL-1β concentration was down-regulated in combination of LPS with MXF than LPS alone at 24 h protein measurements (2,777 $\pm$ 93.34 pg/ml vs. 1,545 $\pm$ 171.9 pg/ml).

CONCLUSIONS. MXF leads to a differential modulation of TLRs in a time-dependent manner. The production of proinflammatory cytokines after LPS stimulation could be suppressed by MXF at different time points. Thus, this study describes the time course for the immunomodulatory effects of the antibiotic MXF in an in vitro sepsis model.

0650

HYPOXIA INDUCIBLE FACTOR-1α (HIF-1α) GENE EXPRESSION IS INCREASED IN EXPERIMENTAL ENDOTOXAEMIA

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INTRODUCTION. HIF-1α is a subunit of HIF-1, a transcription factor, whose levels are increased under hypoxic conditions. Hypoxia reduces the activity of enzymes responsible for the degradation of HIF. Previous studies have shown that in macrophages exposed to LPS, HIF-1α promotes the production of inflammatory cytokines, such as TNFα, IL-1, IL-6, and IL-12. This study also showed that in macrophages, HIF-1α mRNA levels are increased following stimulation by LPS [1]. HIF-1α signals via TLR4, interacts with NF-κB thus contributing to the cytokine production of LPS-induced sepsis in vivo [1]. HIF-1α mRNA and protein levels are also increased in adipose tissues during experimental endotoxaemia in mice [2]. In this study, we have examined whether HIF-1α levels increase in muscle, spleen, liver and small bowel following an LPS challenge.

METHODS. Lipopolysaccharide (LPS) (25 mg/kg) (Escherichia coli O 111:B4, Sigma-Aldrich) was injected intra-peritoneally (ip) under general anaesthesia (2% isoflurane in N2O/O_2) into 8–10 week old male C57BL/6 J mice (Charles River, UK). Control animals were administered equivalent volumes of normal saline, ip. All animals received 1 ml of normal saline subcutaneously to compensate for fluid losses. Mice were killed at 4 or 24 h after injection by cervical dislocation. Tissues were removed and immediately frozen in liquid nitrogen. mRNA levels were determined by quantitative RT PCR in a 12.5 µl reaction volume consisting of 12.5 ng of reverse transcribed cDNA mixed with optimal concentrations of primers and probe and qPCR^{TM}Core kit (Eurogentec, UK) in 96-well plates on a Mx3005P detector.

RESULTS. HIF-1α mRNA levels were elevated in liver (6.5 fold; $p = 0.02$) and spleen (2.8 fold; p 0.008) 4 h post LPS injection. The changes persisted 24 h after LPS treatment with increased expression in liver (3-fold; $p = 0.01$), small bowel (3.1-fold; $p = 0.02$) and spleen (3.2-fold; $p = 3.23 \times 10^{-5}$).

DISCUSSION. Our results build on the increasing evidence that HIF-1α levels are increased during experimental endotoxaemia. We observed a rapid increase 4 h after i.p. injection of LPS in liver and spleen, which suggests early involvement of these organs in the inflammatory changes during endotoxaemia. The HIF-1α mRNA levels begin to normalise in the 24 h group which may indicate some form of cellular adaptation. It is not possible to determine whether this increase in mRNA is secondary to tissue hypoxia or direct LPS stabilisation of the molecule. Our results show that this effect is not limited to myeloid cells but also occurs in tissue depots. Since increases in HIF-1α mRNA expression are not always reflected in HIF-1α protein levels [3], further studies are warranted to ascertain consistency between HIF-1α mRNA and protein expression and to explore the role of HIF-1α in sepsis.

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0651

SERUM PROTEINS MODULATE LIPOPOLYSACCHARIDE (LPS) AND LIPOTEICHOIC ACID (LTA)—INDUCED CELL ACTIVATION

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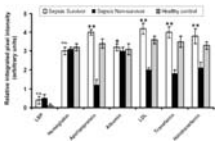
INTRODUCTION. Bacterial structural outer cell wall components, such as LPS and LTA, are potent initiators of an inflammatory response, but the initial interactions of these bacterial components with serum proteins remains to be fully elucidated.

OBJECTIVES. In this study we identified serum proteins involved in the innate recognition of bacterial products and compared proteomic profiles of sepsis survivors, non-survivors and healthy volunteers. We also compared LPS/LTA-induced cytokine secretion in the presence and absence of different serum proteins to explore potential immunomodulatory effects.

METHODS. Using affinity chromatography and mass spectrometry we performed a proteomic analysis of LPS- and LTA-binding serum proteins. We isolated several proteins from normal serum that can interact with LPS and LTA: albumin, LDL, apolipoproteins A-I, A-IV, D, E, transferrin as well as haemoglobin. To investigate immunomodulatory effects, human monocytes were incubated with different serum proteins prior to incubation with LPS or LTA and then analysed for TNF-α concentration. Serum from 25 patients with severe sepsis or septic shock [1] was analysed to quantify the concentration of the previously isolated LPS- and LTA-binding proteins. Highly statistical significance was defined as $^{**}p < 0.001$ and $^{*}p < 0.05$ statistically significant using the t test.

RESULTS. Cytokine assays revealed that serum proteins apolipoprotein, LDL, transferrin and holotransferrin could reduce the production of TNF-α ($p < 0.05$), suggesting that these serum proteins are capable of modulating LPS/LTA-induced responses. When compared with the proteomic profile of serum from septic patients, it was shown that these proteins were in lower abundance than in healthy volunteers. (Fig 1)



Proteomic Profiles

CONCLUSIONS. This suggests that the right balance of these serum proteins in vivo might be important in determining the pathogenesis of Gram-positive and Gram-negative sepsis. It is also novel work that demonstrates that the proteins isolated and previously individually linked with LPS are also associated with LTA.

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0652

DIFFERENCES IN ORGAN AND INFLAMMATORY RESPONSES IN ENDOTOXIN TOLERANT PIGS EXPOSED TO A SECOND HIT OF ENDOTOXIN

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INTRODUCTION. Pretreatment with a low dose of endotoxin has been shown to cause an attenuation of the inflammatory cytokine release.

OBJECTIVES. To study whether endotoxin tolerance-induced reduction of the inflammatory response is associated with attenuation in organ dysfunction development.

METHODS. 24 healthy pigs were randomized to 8 groups, Table 1, and given i.v. endotoxin infusion for 30 or 6 h. The last 6 h, i.e. 24–30 h for the 30 h endotoxin infusion groups was compared to 0–6 h for the 6 h endotoxin infusion groups. The start of the comparison was defined as baseline (Table 2)

TABLE 1

Group	n	Duration of experiment (h)	Endotoxin dose 0–24 h (µg/kg/h)	Endotoxin dose 24–30 h (µg/kg/h)
I	3	30	0.063	1
II	3	30	0.063	4
III	3	30	0.063	0.063
IV	3	30	0.25	1
V	3	30	0.25	4
VI	3	30	0.25	0.25
VII	3	6	1	N/A
VIII	3	6	4	N/A

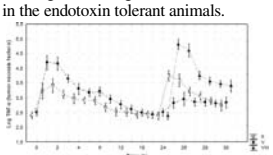
TABLE 2

Group	I	IV	VII	II	V	VIII
TNF (log ng/L) Baseline (B)	2.13 ± 0.37	2.54 ± 0.06	2.78 ± 0.36	2.40 ± 0.21	2.52 ± 0.29	2.40 ± 0.06
B+6 h	2.30 ± 0.18*	2.57 ± 0.16*	3.79 ± 0.71	2.75 ± 0.34	2.84 ± 0.33	3.40 ± 0.30
Rel.change B+1 h	0.29 ± 0.28*	−0.03 ± 0.22*	1.92 ± 0.71	1.35 ± 0.68†	0.32 ± 0.27†	2.41 ± 0.32
Rel.change B+6 h	0.17 ± 0.21*	0.03 ± 0.12*	1.01 ± 0.68	0.35 ± 0.15†	0.33 ± 0.12†	1.00 ± 0.24
PaO_2/FiO_2(kPa) Baseline (B)	39.8 ± 12.8*	27.4 ± 9.3*	62.6 ± 4.0	38.1 ± 17.8	41.7 ± 12.2	49.2 ± 11.5
B+6 h	41.5 ± 4.5	28.4 ± 14.1	42.3 ± 14.6	13.4 ± 3.2†	18.9 ± 6.2†	34.1 ± 7.2
Index B+3 h	1.2 ± 0.2*	1.0 ± 0.1*	0.4 ± 0.1	1.1 ± 0.8	0.8 ± 0.1	0.6 ± 0.2
Index B+6 h	1.1 ± 0.3	1.0 ± 0.4	0.7 ± 0.2	0.4 ± 0.1†	0.5 ± 0.2	0.7 ± 0.1

RESULTS. VII and VIII had higher TNF-α than I and IV, and II and V, respectively. PaO_2/FiO_2 ratio, pulmonary compliance, and base excess were not attenuated in I and IV and II and V as compared to VII and VIII, respectively. II and V had lower values in PaO_2/FiO_2 and compliance than VIII at the end of the experiment.

Absolute values at baseline and 6 h after baseline. Values relative to baseline at the time point of the largest change and at the end of the experiment. Mean ± SD. *significant difference ($P < 0.05$) compared to VII †significant difference compared to VIII

CONCLUSIONS. Endotoxemia during 24 h followed by a 4 to 64-fold increase in endotoxin challenge for 6 h resulted in markedly attenuated inflammatory responses compared to animals not primed with endotoxin. However, the responses in respiratory function and hypoperfusion were not similarly attenuated and in animals given the highest second endotoxin hit, respiratory dysfunction was even more evident than in the endotoxin tolerant animals.



TNF

0653

PERSISTENT WHOLE BLOOD DECREASED TNF-A PRODUCTION AFTER LPS STIMULATION IN SEPTIC ICU PATIENTS

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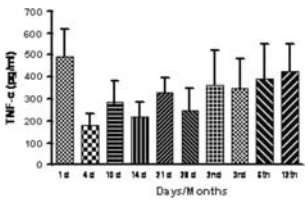
INTRODUCTION. Sepsis is characterized by inflammation which may evolve to a state of immunosuppresssion expressed as whole blood decreased cytokine production capacity. The aim of the study was to examine the time frame of the resolution of immunosuppression presented in septic critically ill ICU patients.

MATERIAL AND METHODS. We included critically ill ICU patients suffered a septic episode that were followed-up for a period of 12 months. Whole blood was obtained on days 1, 4, 14, 21, 28 and on 2nd, 3rd, 6th, 12th month thereafter. Whole blood TNF-a production capacity was evaluated ex-vivo after stimulation with LPS (500 pg) and incubation for 4 h. Samples were then centrifuged and the supernatants were stored at −70°C until TNF-a measurements using the ELISA method.

RESULTS. We included 8 male patients (6 trauma patients, 2 ischemic stroke) with mean age of 54.3 ± 7.9 years old and mean ICU stay of 54.6 ± 15.9 days, which presented septic shock during their ICU stay. TNF-a after ex-vivo LPS stimulation is shown in Fig. 1.



Post LPS stimulation whole blood TNF-a *p*]

There was a progressive increase of TNF-a production capacity which however was still under 500 pg/ml after 12 months. Analyzing individual patients we found that one patient was immunocompetent on day 28th, two patients on 2nd month while the other five were still immunosuppressed on 12 month evaluation.

CONCLUSIONS. Critically ill patients with sepsis suffer from immunosuppression expressed as decreased TNF-a production after LPS stimulation which may persist for a variable period of time after ICU and Hospital discharge.

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EFFECTS OF INFLIXIMAB (REMICADE®) AND GLUCOCORTICOIDS ON IN VITRO LEUCOCYTE CYTOKINE RESPONSES AFTER STIMULATION WITH LIPOPOLYSACCARIDE (LPS)

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During severe inflammatory bowel disease, combination therapy with TNF-α antibodies (e.g. infliximab), and other immune modulators is often used. Due to addictive immunosuppressive effects such treatment may increase the risk of opportunistic infections. In a human whole blood model we have studied the effects of different concentrations of infliximab and/or glucocorticoids (hydrocortisone or methylprednisolone) on the concentrations of selected cytokines after LPS stimulation. A multiplex antibody bead kit measuring 25 different cytokines was used. Infliximab in plasma concentrations seen in patients shortly after an injection (50–200 μg/ml), inhibited the concentrations of TNF-α, IL-1ra, MCP-1, IL-8 and IL-12.When combined with methylprednisolone, the TNF-α and IL-1ra levels were further reduced. A strongly suppressive effect was also seen with very low doses of infliximab (0.08 μg/ml) on the TNF-α concentration. Together with hydrocortisone, infliximab in low doses enhanced the suppressive effects of hydrocortisone on TNF-α, IL-1β, IL-8 and MIP-α levels. Immune modulating effects of infliximab were demonstrated even in very low concentrations seen in patients several weeks after an injection due to a long half-life. Infliximab in all doses tested enhanced the suppressive effects of glucocorticoids on cytokine concentrations.

ICU economics and management: 0655–0668

0655

IS RATIONING OF INTENSIVE CARE JUSTIFICALE? A COST EFFECTIVENESS ANALYSIS

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OBJECTIVE. To assess the cost effectiveness of admission to intensive care

DESIGN. A multi-centre observational study in 11 hospitals in 7 EU countries

SETTING. Intensive care units and hospital wards.

PARTICIPANTS. 7,659 consecutive patients referred for intensive care.

METHODS. 28-day mortality and total hospital cost were compared for patients accepted in ICU versus patients not accepted and treated in the ward. Daily ICU and ward costs were estimated using a top-down approach (cost-block method). Subgroup analyses were performed by patient severity on admission (SAPSII predicted mortality: <5%, 5–40%, >40%). Analyses of effectiveness and cost were performed using multilevel regression models adjusted for age, Karnofsky score and indication for ICU admission.

RESULTS. Admission to ICU produced a relative reduction in mortality risk of 0.70 (0.52–0.94; $p = 0.017$) at 28 days. When subdivided by predicted mortality, the risk of death was: in the <5% predicted mortality group 1.49 (0.79–2.81; $p = 0.213$), in the 5–40% group 0.7 (0.51–0.97; $p = 0.031$) and in the >40% group 0.55 (0.37–0.83; $p = 0.004$). Average costs per life saved, measured in dollars for all patients was $103,771; for 5–40% mortality risk was $117,675 and >40% risk $60,046. Costs per life year saved were for all ICU admissions $7,065, for 5–40% predicted mortality $8,012 and >40% $4,088. Results were very similar when considering 3-month mortality.

CONCLUSION. Not only does ICU appear to produce an improvement in survival, but the cost per life saved falls for those with a >40% risk of death. This suggests that ICU is cost effective and the concept of rationing should be reconsidered.

0656

HOSPITAL COST ANALYSIS OF NOSOCOMIAL PMNEUMONIA ACCORDING TO MECHANICAL VENTILATION REQUIREMENTS AT SOUTH AMERICA

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INTRODUCTION. Nosocomial Pneumonia is a health condition of an increasing importance at the ICU, specially mortality and cost related. Based on a mechanical ventilation requirement two types of cost risk factor related are recognized: Nosocomial pneumonia associated or not to mechanical ventilation. These differences may imply a distinct utilization of health resources. Colombian registries comparing hospital cost of both two types of in-hospital pneumonias in critically ill patients have not been performed yet, although nosocomial pneumonia is prevalent in this population.

AIM. To analyze hospital cost of these two types of nosocomial pneumonia on critical ill patients.

METHODS. One year data were collected and 218 patients participated in the study. From 218 patients admitted to the ICU, 9 (4.12%) developed nosocomial pneumonia, 209 (95.8%) patients did not show nosocomial infection, and 55 (26.3%) patients from the last group were on mechanical ventilation. The total cost from the two groups was compared and cost-effective analysis was calculated. Cost variables analysed were: total pneumonia cost at the ICU, total cost per patient, cost-effective ratio (patients who responds to the treatment as a final aim), and total cost recovery from patients ICU management. Also was taken into account the cost differences between the group of patients with or without mechanical ventilation and nosocomial pneumonia.

RESULTS. Infection control was the outcome variable that was studied to evaluate cost-effective ratio. Nosocomial pneumonia was no prevalent over the year. However, cost management of this group of patients was higher than the patients without infection. To get a patient free of nosocomial pneumonia with the treatment we should spend 5947 USD. In other words, the cost to treat a patient with nosocomial pneumonia is 156.5 times more than a patient without infection (Table 1).

TABLE 1 NOSOCOMIAL PNEUMONIAE COST (1 USD = $ 2227.68 COLO

Cost variable	Nosocomial pneumonia (USD)	No pneumonia (USD)	No pneumonia but on mechanical ventilation (USD)
Number of patients	9	208	55
Total cost ICU management	$ 715,455.753 (321.166)	$ 3.171,072.487 (1,423.486)	$ 1.833,163.595 (822.902)
Total cost per patient	$ 79,495.083 (35.685)	$ 15,172.595 (6.810)	$ 33,330.247 (14.961)
Cost-effective ratio	$ 13,249.180 (5.947)	$ 84.763 (38)	$ 1,333.209 (598)
Total recovery per patient	$ 74,396.960 (33.396)	$ 17,025.554 (7.642)	$ 33,544.024 (15.057)
Cost-effective surplus	$ -5,098.122 (-2.288)	$ 1,852.958 (831)	$ 213.777 (95)

CONCLUSION. Although the number of patients included was small, this study shows an approach of the importance of hospital cost in both types of patients with nosocomial pneumonia (with or without mechanical ventilation) in Colombia. Besides, what was clear the cost-effective difference when a patient developed nosocomial pneumonia. South America countries should start to spend more effort to reduce cost and focus on prevention of infection at the ICU. This is a way of taking the first step for projecting health costs.

0657

MARKET SHARE OF HUNGARIAN INTENSIVE CARE UNITS FROM THE TOTAL HOSPITAL CARE MEASURED BY THE DIAGNOSIS RELATED GROUPS (DRG) SYSTEM

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AIMS. In the early 1990, a Diagnosis Related Groups-like financing system was introduced in Hungary including all the Hungarian acute care hospitals. The aim of the study is to analyse the market share of intensive care units (ICUs) according to DRG system.

METHODS. Data were derived from the financial database of the National Health Insurance Fund Administration, the only health care financing agency in Hungary (1995–2008). All the intensive care units were involved into the study. The following indicators were used for the analysis: number of cases, the amount of DRG weight-number and total in-patients care hospital days. Regression lines and Pearson coefficients (R^2) were calculated.

RESULTS. Measuring by the number of cases (patients), the market share of intensive therapy was between 0.84 and 0.98% in the first 4 years (1995–1998). In the next year a rise in the market share happened to 1.45% and after that a continuously elevation was found to 1.8% until 2005. During the last 3 years the market share increased to 1.21. Comparing 1995 to 2008 the market share -measured by the number of cases- increased to 144%. Measuring by the amount of DRG weight-number, the market share of intensive care within in-patients care increased from 1.17% (1995) to 7.68% (2008) in Hungary. Comparing the start to the end of the analysed 14 years (1995–2008) the reimbursement share in DRG weight-number increased 6 times higher. The market share of ICUs from the total in-patients care hospital days has been increased from 0.99% (1995) to 2.33% (2008). The Pearson coefficients (R^2) for number of cases, DRG weight-number and total in-patients care hospital days are 0.16; 0.90 and 0.97, respectively.

CONCLUSIONS. The market share and health insurance financial conditions of intensive care units varied significantly between 1996 and 2008. The Hungarian health care reforms between 2006 and 2008 had a significant effect on the market share and financial conditions of intensive care units. The overall financial change of DRG system on the Hungarian intensive care seems to be advantageous.

0658

DROTRECOGIN ALPHA—CUTTING COST, NOT CORNERS!

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INTRODUCTION. Drotrecogin Alpha (DA) is an effective treatment in sepsis induced Multi Organ Dysfunction Syndrome (MODS) especially in the presence of Septic Shock (SS) Optimum duration of treatment of DA is 96 h infusion. Cost of DA infusion for 96 h is average INR 480,000 (Euro7680) in India, whereas the average cost of 8 days of ICU treatment of a patient with sepsis with MODS, including bed charges, organ support therapies, drugs, laboratory investigations and consultation fees is approximately INR 120,000 (Euro 1920). Thus the cost of 24 h infusion of DA is approximately equal to the 8 day cost of standard ICU care. It is unclear whether stopping DA before 96 h, in patients in whom SS resolves before 96 h, ultimately affects outcome. This is more relevant in developing countries like India where cost of 96 h of infusion of DA is beyond the reach of majority of patients eligible for DA. We performed a prospective study to evaluate this concept.

METHODS. During the period of June 2006 to December 2008, patients with severe sepsis having $\geq$2 Organ Dysfunction (O.D.) were offered the option of DA as an adjunct therapy. For those who opted for it, DA infusion was initiated within 24 h of onset of SS. DA infusion was stopped before completion of 96 h only if septic shock was completely resolved, otherwise was continued for 96 h. Other ICU care was provided as per contemporary standard of care. All these patients were hemodynamically monitored in the ICU after stopping the infusion.

RESULTS. 172 patients with severe sepsis having $\geq$2 Organ Dysfunction, were offered the option of DA.18 patients opted for it. In 13 out of these 18 patients DA infusion could be stopped before 96 h assuring complete reversal of septic shock. Their data were analysed in this study. Average APACHE II and SAPS II scores were 22.23 $\pm$ 3.87and 53.92 $\pm$ 14.45, respectively. 11 out of 13 patients were discharged home after complete recovery. Shock did not reappear in the subsequent 72 h in any of the 13 patients. Two patients developed new episode of Ventilatory Associated Pneumonia on day 4 and 10, respectively after stopping the infusion of DA and could not be salvaged.

CONCLUSION. DA infusion can be safely stopped before completion of 96 h in patients who show rapid reversal of SS. This is associated with significant cost saving without compromising the outcome or quality of care (Table 1)

TABLE 1 PATIENT DATA

Variable	Value
Duration of Shock before DA	15.92 $\pm$ 7.29 h
Complete Reversal of Shock after DA infusion.	50.84 $\pm$ 26.07 h
Duration of DA infusion	70.33 $\pm$ 20.76 h
Duration of ICU stay	11.61 $\pm$ 5.18 days
Total Hospital Bill till discharge or death Per patient (Excluding cost of DA)	INR 230921 $\pm$ 147273 Euro 3694 $\pm$ 2356
Cost of DA infusion per patient	INR 347,692 $\pm$ 38330 Euro 5563 $\pm$ 613
Cost saving due to early stoppage of DA (per patient)	INR 132,308 $\pm$ 38,330 Euro 2117 $\pm$ 613

Ref -1Euro $\approx$ INR 62.5(Average conversion rate in 2008)

0659

WHAT AFFECT MORE THE COST TO MANAGE PATIENTS AT THE ICU IN SOUTH AMERICA: AN APPROACH BASED ON MULTIPLE REGRESION MODEL

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INTRODUCTION. Cost management of patients at the ICU is important mainly when we want to know the difference between bed cost, drugs, laboratory cost, radiology, procedures and ICU piece of equipments. Based on ICU data base we may demonstrate which area should be monitor to get a future cost reduction at the ICU.

AIM. To develop a multiple regression model to analyze the cost of the ICU.

METHODS. One year data were collected and 143 patients participated in the study. Patients were admitted at the general mix ICU with patients with different type of pathologies: Septic shock, neurologic patients, COPD, medical cardiovascular diseases, and postoperative patients, etc. The average of the age was 63 years, and APACHE II score around 16. The cost of its pathology was taken into account and also the cost of each analyzed group of data.

STATISTICS. Dependent variable was total cost at the ICU management, and independent used variables were bed cost, drugs cost, lab cost, radiology cost, cost of procedures, healing material cost, and piece of ICU equipments cost. SPSS 15 software was used to calculate the model and 0.05 was considered statistic significant.

RESULTS. The complete and reduced model was get for each of seven groups of analysed data by the method of variables selection. Correlation matrix was studied in order to get any co-linearity problem. The *t* test for the complete model was significant for the majority of the variables, $F = 1164.04$ ($p = 0.000005$), besides r^2 up to 0.98, and Durbin-Watson was 1.98. The multiple regression analysis showed association between total cost at the ICU and variables such us bed, drug, lab, and equipments. For each increased million in lab cost, the average of the cost management at the ICU is augmented up to 2.33 millions. Also, drugs cost was the variable with more power in management total cost. Results of the complete model are showed: *Total cost management $= -1{,}229.631 + (1.08 \times \text{bed}) + (2.33 \times \text{lab}) + (0.85 \times \text{drug}) + (1.13 \times \text{procedure}) + (1.14 \times \text{radiology}) + (0.10 \times \text{material}) + (1.22 \times \text{equipment})$.

CONCLUSION. This study shows an approach of the importance of hospital cost at the ICU. We have detected high power by drugs in total cost management of patients and also the influence of laboratory in final results. In order to reduce cost at the ICU the management should be not only focus on stay but also in what kind of drugs are formulated to the patients, and the right indications of laboratory test. South America countries should start to spend more effort to reduce cost and focus on "*mal-cost-practice*" at the ICU (Table 1)

TABLE 1 MULTIPLE REGRESSION MODEL RESULTS (COLOMBIAN PESOS)

Cost variable	Un-standardized (millions)	Coefficient	Pearson correlations
Bed	1.08		0.89
Laboratory	2.33		0.88
Drugs	0.85		0.95
Procedures	1.13		0.10
Radiology	1.14		0.63
Healing material	0.10		0.25
ICU piece of equipments	1.22		0.87

0660

HOW DEFINE WHEN THE MANAGEMENT WILL COST MORE THAN 978 USD PER DAY AT THE ICU IN SOUTH AMERICA? AN APPROACH BASED ON LOGISTIC REGRESION MODEL

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INTRODUCTION. Based on ICU data we may demonstrate a formula to calculate the probability to have a cost higher than 978 USD per day at ten ICU. Colombian registries comparing hospital cost in critically ill patients have not been performed yet, although intensive care is one of the most expensive services at the hospital.

AIM. To develop a logistic regression model to analyze the cost of the ICU.

METHODS. One year data were collected and 143 patients participated in the study. Patients were admitted at the general mix ICU with patients with different type of pathologies: Septic shock, neurologic patients, COPD, medical cardiovascular diseases, and postoperative patients, etc. The average of the age was 63 years, and APACHE II score around 16. The cost management at the ICU was split: 1 = More than 978 USD and 0 = less than 978 USD and it was defined as a dependent variable. Included as an independent variables were all risk to increase the cost at the ICU: Age, hour of admition, sex, re-intubation, and severe sepsis classification, mechanical ventilation requirements at the ICU, tracheotomy, nutrition score risk, and ARDS.

STATISTICS. SPSS 15 software was used to calculate the model and 0.05 was considered statistic significant.

RESULTS. The complete model was get for each of nine groups of analysed data by the method of variables selection. The model showed a Nagelkerke r^2 up to 0.79, and Hosmer and Lemeshow test Chi^2: 2.34 ($p = 0.938$). The logistic regression analysis showed that the cost higher than 978 UDS could be explained by the model. When all variables remain constant, a patient with a reduction in one point in NSR will have a cost OR reduction up to 0.26, and is statistic significant. Complete model are showed in Table 1. **Probability to get a cost higher than 978 USD per day management* $(\%) = 1/1 + 2.7188282^{-Z}$. $z = 7.21924 - 0{,}046\ (h) + 0{,}225(age) - 5{,}201(sex) - 34{,}193(\text{Re-intubation}) - 13{,}115(\text{Sepsis severe}) + 45{,}557\ (\text{Mechanical ventilation}) - 20{,}175\ (\text{Tracheo}) + 1{,}326\ (\text{NSR}) + 30{,}475\ (\text{SDRA})$

TABLE 1 LOGISTIC REGRESSION MODEL RESULTS (COL PESOS)

Variables in the equation	β Coefficient Constant = 7,219	Wald	Exp (β) = OR
Hour	0.046	0.018	1.04
Age	−0.225	2.432	0.79
Gender	5.201	0.621	181.55
Re-intubation	38,285	2,974–6	4,2316
Severe sepsis	13,115	2,131	4,965
Mechanical ventilation	−45,557	4,212–6	1.63–20
Tracheotomy	20.175	1.574	5.788
Nutri-score (NSR)	−1.326	1.454	0.26
ARDS	−30.47	5.480	5.81–14

CONCLUSION. We have detected some sensible variables to explain if the management of patients at the ICU will require a cost higher than 978 USD per day. In order to reduce cost at the ICU the management should be not only focus on stay but also in what kind of procedures and complications appear inherence to the patients or to the management of theirs pathologies. South America countries should start to spend more effort to reduce "*mal-cost-practice*" at the ICU.

0661

AUDIT OF COST OF INTENSIVE CARE IN AN INDIAN CANCER HOSPITAL

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INTRODUCTION. ICU costs, a major component of health care costs, are rising all over the world. Limited data is available for ICU costs in India.

OBJECTIVES. To find out the costs of intensive care and compare the costs of care for post-surgical cancer patients with those admitted from oncology ward.

METHODS. The fixed costs were obtained from respective departments. A specially designed form was filled for calculating variable costs.

RESULTS. Data for variable cost was collected for 101 patients, admitted between 8 November and 29 December 2005. There were 55 postoperative admissions. The ICU LOS was less for postoperative admissions [64.84 (58.47) vs. 106.84 (64.05) h]. The ICU mortality was higher in patients admitted from the ward (43.47 vs. 3.6%, $p < 0.05$). The mean daily variable cost of care was 176.37 US$ for all patients, being much higher for patients admitted from the ward (223.93 vs. 122.06 US$, $p = 0.002$), excluding professional fees and room charges. In decreasing order, blood and blood products, drugs (mainly antibiotics), investigations and cardiovascular monitoring were the main components for the variable costs in ward patients, as these were mainly hematooncology patients. Investigations and imaging was the highest component of variable costs in postoperative patients. The fixed cost per patient (assuming 100% occupancy and 650 admissions per year) was 467.56 US$. Salaries of medical and support staff (67.65%), electricity (10.1%), and equipment (6.99%) were the main contributors to the fixed costs. Continued use of old equipment (with low or zero depreciated value) may have led to low costs for equipment. In 2006, the average daily income for an Indian national was 1.99 US$.

CONCLUSION. Cost of intensive care in India appear to be lower than those in the developed countries. Intensive care is costlier for patients admitted from oncology ward as compared to postoperative cancer patients. However from the perspective of much lower average daily income and absence of national health schemes and insurance cover, these costs are staggeringly high.

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GRANTS. None.

0662

EXPERIENCES TO BE AVOIDED: DETERMINANTS OF NON-OPTIMAL SATISFACTION IN ICU-PATIENTS

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INTRODUCTION. Due to considerable ceiling effects [1] it is futile to ask ICU patients for their general satisfaction with their treatment. Instead, analysing the experiences of not optimally satisfied patients as the "tip of the iceberg" can help to discover important causes of adverse perceived service quality as a measure of outcome quality [2]. Using a questionnaire we studied which experiences contribute to optimal (oSat) versus non-optimal satisfaction (noSat) with care in perioperative ICU patients.

MATERIAL AND METHODS. 82 consecutive patients were interviewed anonymously 2–7 days after discharge from ICU (written informed consent, ethical committee approval) using a questionnaire to evaluate subjective experiences. One item on „general satisfaction" and 31 items on intrapersonal (I_{1-14}), communicative (C_{1-10}) and somatic aspects (S_{1-7}) had to be answered on a 4-point-Likert-scale (1 = full agreement, 4 = full disagreement) [1]. These medical descriptors were registered: prevalent and acute diseases, SAPS II, SOFA, TISS-28, interventions, medication, length of stay and of ventilator therapy. Statistics: optimally satisfied patients ("general satisfaction": full agreement) were compared to non-optimally satisfied patients ("general satisfaction": no full agreement). Receiver-operating-characteristic (ROC) curves compared oSat and noSat patients for each separat item. Stepwise forward regression was used to find independent determinants of dissatisfaction regarding partial correlations and usefulness (experiences and medical descriptors) [3]. $p< 0,05$.

RESULTS. 66 of 82 patients were oSat. ROC-analysis suggested group differences in 17 of 31 aspects; as expected, noSat patients consistently described less desirable experiences. Stepwise logistic regression revealed that 1 intrapersonal and 2 communicatory aspects independently determined the group difference (I_4: I could trust the staff members; C_1: I could communicate and I was understood; C_7: I was treated kindly). Somatic experiences and medical descriptors did not distinguish between the groups.

CONCLUSIONS. Experiences of patients who are not optimally satisfied with the received ICU care can be analyzed detailledly to detect causes of adverse perceived service quality. Our results underline that communicatory and intrapersonal aspects strongly influence this measure of outcome quality.

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0663

THE RISK OF UNDERESTIMATION OF PATIENT-SUBJECTIVE BURDENS BY ICU STAFF INCREASES WITH TREATMENT INTENSITY

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INTRODUCTION. Service providers' wrong guesses about clients' experiences during a service encounter are one form of client-professional-gaps (cp-gaps), and cp-gaps are likely to cause suboptimal service quality [1]. We have shown that cp-gaps can exist between ICU patients and ICU staff [2]. We hypothesized that cp-gaps are modified by treatment intensity.

MATERIAL AND METHODS. 82 consecutive patients were interviewed anonymously 2–7 days after discharge from ICU (written informed consent, ethical committee approval) using a questionnaire to evaluate subjective experiences. General satisfaction and 31 items on intrapersonal (I1-14), communicatory (C1-10) and somatic aspects (S1-7) had to be answered on a 4-point-Likert-scale (1 = full agreement, 4 = full disagreement)1. Staff was interviewed analogously with a questionnaires focussing on staff's assumptions about patients' experiences. Length of stay (LOS), duration of mechanical ventilation (DOMV) and the sum of all TISS 28- and SAPS II-score values cumulated during the whole ICU stay (Σscores) were used as indicators of treatment intensity. Statistics: Patients answers were weighed for each measure of treatment intensity (LOS, DOMV, ΣScores). After weighing, Receiver-operating-characteristic (ROC) curves analyzed cp-gaps for each separat item. Stepwise forward binary logistic regression was used to find independent determinants of cp-gaps [3]. $p< 0,05$.

RESULTS. In general, cp-gaps were found rather in the intrapersonal and communicative than in the somatic sphere. Multivariate analysis showed that patients' burdens were overestimated by the staff, when treatment intensity was not taken into account. Alarmingly, increasing treatment intensity led to underestimation of some of the patients's burdens by the staff (blind spots). Blind spots were particularly found in the intrapersonal sphere and in mechanically ventilated patients.

CONCLUSIONS. Treatment intensity increases the risk that ICU staff underestimates patients subjective burdens during an ICU stay. Mechanically ventilated patients are at particular risk that their burdens remain unrecognized.

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0664

PREDICT: INCREASING THE PARTICIPATION OF THE ELDERLY IN CLINICAL TRIALS. PRELIMINARY DATA

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INTRODUCTION. Effective treatments may be available for many conditions that affect older people. However, the evidence that supports these treatments may have been drawn from patients who were of a younger age range for reasons such as avoidance of comorbidities and polypharmacy, potential difficulties of understanding or simply established research habits.

OBJECTIVES. Therefore a nine nation Framework 7 project (Czech Republic, Italy, Israel, Lithuania, Netherlands, Poland, Romania, Spain, UK) was established to assess clinical trials in a range of conditions that affect older people (heart failure, hypertension, coronary heart disease, Alzheimer's disease, depression and colorectal cancer). These areas commonly impact on the recovery of older people from critical illness.

METHOD. 5 work packages were established: (1) Systematic Reviews within the literature covering these areas were examined, plus an assessment of the WHO International Clinical TrialsRegistry of ongoing trials conducted into the treatment of heart failure. (2) An investigation into the opinions and experiences of medically related professionals and ethicists to inclusion of the elderly. (3) An investigation into the opinions and concerns of patients and their relatives/carers regarding inclusion of the elderly and how participation might be increased. (4) The conclusions of the first two workpackages will be used to develop a Patients' Charter for use across Europe and beyond that will guide future studies to increase the participation of the elderly in clinical trials wherever this is feasible. (5) The data gathered and conclusions drawn, including the Charter will be disseminated widely and used for a basis for further study, development and progress.

RESULTS. 358 relevant articles published up to 2008 were identified. Under-representation of older people was demonstrated in trials of treatments in a range of conditions. This is often because of exclusion criteria that relate to comorbidites and concurrent treatments. Little has been published on ways to increase participation. Seventy currently ongoing trials in heart failure were identified. These demonstrated a similar picture with fewer than 10% of trials including patients over 80.

CONCLUSION. The initial workpackage has confirmed that under representation of the elderly has and is occurring in clinical trials. Why this is occurring and how this can be reasonably changed will be investigated in workpackages 2 and 3. Initial data suggest a Charter for the Elderly is necessary (which will impact on all areas of clinical trials) and this may suggest that a specific assessment of critical care studies may be worthwhile.

GRANT REFERENCE.
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0665

INTENSIVE CARE UNIT PHYSICIANS: SOCIODEMOGRAPHIC PROFILE, WORKING CONDITIONS AND FACTORS ASSOCIATED TO THE BURNOUT SYNDROME

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AIMS. Burnout syndrome is a response to prolonged occupational stress involving three main dimensions: emotional exhaustion, depersonalization and reduced personal accomplishment. This study aimed to describe socio-demographic characteristics of intensive care unit physicians and evaluate factors associated to the presence of Burnout syndrome in this population.

METHODS. A cross-sectional study was performed to evaluate physicians who have worked in critical care in the city of Salvador, Bahia, Brazil, with a minimum weekly workload of 12 h. An anonymous self-reported questionnaire, divided in two parts: socio-demographic characteristics and evaluation of the Burnout syndrome was used according to the Maslach Burnout Inventory.

RESULTS. From a total population of 333 intensivists, 297 (89%) were studied, most of them male (70%). The mean age and time after graduation were, respectively, 34.2 and 9 years. The mean medical weekly workload was 72 h. High levels of emotional exhaustion, depersonalization, and reduced personal accomplishment were found in, respectively, 47.5, 24.6 and 28.3%. Prevalence of the Burnout syndrome, considered as high level in at least one dimension, was of 63.3%. This prevalence was statistically lower in physicians specialized in intensive care, as weel in intensivists who reported a hobby or had regular physical activity. Prevalence was higher in physicians who worked in the intensive care units for more than 24 uninterrupted hours per week. Intensivists with burnout syndrome had lower mean scores of quality of life evaluated by Whoqol–Bref questionnaire.

CONCLUSIONS. Burnout syndrome had a very high prevalence among critical care physicians and it was more frequent in the physicians with a higher workload. Therefore, consideration must be given to measures which might be adopted to modify working conditions, the physician-patient relationship and the motivation of these professionals.

KEYWORDS. Burnout, professional/psychology; Stress; Working conditions; intensive care units.

0666

DEMAND-CONTROL MODEL AND BURNOUT SYNDROME IN INTENSIVISTS FROM SALVADOR, BAHIA, BRASIL

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INTRODUCTION. The Demand–Control Model is a worldwide used model that evaluate the psychological impact of stroke. According to the D–C model, job strain results from the interaction of two main dimensions of the work environment: psychological demands and control. The Job Content Questionnaire (JCQ) has been proposed as an instrument for measuring these work dimensions. Burnout Syndrome is a response to prolonged occupational stress that involves three main dimensions: emotional exhaustion, depersonalization, and reduced personal accomplishment.

AIMS. This cross sectional study investigated the association between control-demand model and *Burnout* Syndrome in a population of 333 intensivists physicians from Salvador City, State of Bahia, Brazil.

METHODS. 297(89%) intensivists were reported. An individual, self-report questionnaire has evaluated the doctors' psychological aspects of work, using the demand-control model (Job Content Questionnaire) and their mental health, by using the Maslach Burnout Inventory (MBI).

RESULTS. The study found excessive work overload, high proportion of doctors on duty, low income according to hours worked. The prevalence of Burnout Syndrome was 7.4% considered as high level in three dimensions and it was much strongly associated with the aspects of work psychological demand than with work control. Doctors in high strain (high demand and low control) presented prevalence of Burnout Syndrome 10.2 times higher than those in low strain (low demand and high control) jobs.

KEYWORDS. Work conditions, mental health, demand–control model, Burnout Syndrome, Intensivists

0667

ICU MANAGEMENT: THE EFFECT OF HIRING A NURSING DIRECTOR ON STAFF TURNOVER RATE

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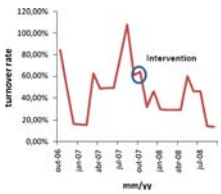
INTRODUCTION. ICU is a complex and stressful environment. High staff turnover is a major problem that can impact clinical and financial performance. Hospitals leaders have to set best managerial practices when running this high cost unit in order to assure good talent management. Leadership is an important issue that can affect job fulfillment and retention of skilled health professionals. There are controversial data on literature about the best model of leadership delivery in ICU.

OBJECTIVES. The aim of this study was to evaluate the effect of hiring a nursing director on staff turnover rate (TR).

METHODS. We retrospectively collected data on TR between November 2006 and September 2008 in our 8-bed ICU (300 admissions per year). We considered two different periods of observation, the first one (October 2006–September 2007) as pre-intervention (PI) with the ICU coordinated only by a certified ICU physician and the second one as intervention (I) period (October 2007–September 2008) with the coordination being shared between a physician and an intensive care trained nurse. In the I period there was a co-management responsibility over the multiprofessional team and human resources policy.

RESULTS. TR data are shown in graph 1. The mean TR decreased in the I period (53 vs. 34%; $p = 0.09$) but it did not reach statistical significance. There were no differences in ICU occupancy rate (42 vs. 40%; $p = 0.82$), APACHE II score (11 vs. 12; $p = 0.47$) and ICU mortality (8.4 vs. 9.2%; $p = 0.72$). We observed a difference in ICU staff head count (25 vs. 27; $p = 0{,}009$) that could have contributed to reduce workload and TR in I period. Even with observed trend toward decreased rates in the I period our unit was underperforming in comparison with other Brazilian units with TR ranging from 25 to 30%.

CONCLUSIONS. We were unable to demonstrate any benefit because our study was not powered to do so. Further investigation is needed to show if a nursing director could positively impact ICU staff TR and if co-management between physicians and nurses could better align talent allocation with ICU business strategy setting the stage for improved clinical and financial operations.



Graph 1

0668

ICU BUSINESS: EFFECTS OF TV ADVERTISING AS A STRATEGY TO INCREASE ADMISSIONS AND OCCUPANCY RATE

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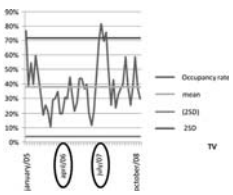
INTRODUCTION. ICU is a high fixed costs business and private hospitals are facing a highly competitive commercial environment. In this setting, volume of new admissions and occupancy rate are directly related to revenue generation, investment capacity and attractivity to strategic clients. In order to achieve financial viability hospitals have to develop a successful marketing mix and choose the appropriate channels of communication. Since critical care typically has been viewed as a service provided by a hospital, and not a product line, business plans have not historically been developed to expand and promote critical care. There are scarce data about the effects of marketing actions on ICU productivity.

OBJECTIVES. The aim of this study is to determine the effects of hospital-directed TV advertising campaign on ICU admissions and occupancy rate.

METHODS. Our 8-bed ICU operates on overcapacity considering Brazilian standards and the size of our hospital (50-bed). Between January 2005 and December 2008 we collected data on admissions and occupancy rate considering that in 2006 and 2007 the hospital engaged on TV advertising. The themes of the campaigns were hospital-directed and not ICU-focused. For data analysis we considered three periods: period 1 (01/05–03/06) as pre-intervention period, period 2 (04/06–12/07) as intervention period (insertions on TV) and period 3 (01/08–12/08) as post-intervention period (with no insertions on TV).

RESULTS. Data on occupancy rate and its temporal relationship with TV insertions are shown in graph 1. We admitted 1,044 patients during the study period. We observed a decreased number of admissions per month in the intervention period when we compared period 1 and period 2 (24 vs. 18, $p = 0.04$) and period 2 with period 3 (18 vs. 23, $p = 0.03$). We have found an increased occupation rate in the intervention period (36 vs. 40 vs. 38%, NS) and an increased occupancy peak/mean ratio (2.03 vs. 2.16 vs. 1.55, NS) but it did not reach statistical significance. We also observed a progressive increase in participation of emergency room as origin of new ICU admissions (6 vs. 22 vs. 26%, NS) Graph 1.

CONCLUSIONS. We were unable to demonstrate any incremental benefit of TV advertising on ICU admissions and occupancy rate. As our study considered only a campaign with sporadical TV insertions and a not ICU-focused strategy, further work is necessary to determine the effects of regular insertions with ICU-focused themes.



Graph 1

ICU performance and benchmarking: 0669–0682

0669

IMPROVING QUALITY, SAFETY AND COSTS BY IMPLEMENTING A PERFORMANCE MEASUREMENT AND MANAGEMENT APPROACH FOR COMMON INVESTIGATIONS IN THE ICU

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INTRODUCTION. Quality and safety in health care are receiving widespread attention, prompting efforts to decrease practice variation, increase adherence to evidence-based guidelines, monitor processes, and measure outcomes of patient care. We developed an approach for integrating evidence-based practice into test ordering and evaluated its impact on 3 common investigations in the intensive care unit (ICU) using a before-after approach.

METHODS. A committee was struck involving hospital administration, clinical experts, local physician champions and other stakeholders. The committee reviewed financial data and test utilization patterns to identify high-volume or high-cost investigations for which local expert opinion felt best practices implementation might improve patient care and decrease inappropriate utilization. Best practice policies were developed based on existing guideline statements or expert consultation. These policies were then operationalized using techniques and tools from Six Sigma's Develop–Measure–Analyze–Design–Verify–Process. Our strategy included adapting the order interface of the local computerized order entry system using principles of user interface design. We collected monthly utilization data on the targeted investigations and reported and disseminated results to front-line care providers. Compliance with the developed evidence-based guidelines was also reported.

RESULTS. We identified the ordering of serum troponin-I, chest radiographs and blood culture draws as the target investigations. Following the generation of best-practice policy and model development, appropriate laboratory testing of troponin-I improved by 18% (from 42% in the 12 months prior to intervention to 60% over the 6-month project period; $p < 0.05$), with trend towards a reduction in the total number of tests ordered per week in each ICU (from 532 to 437 pre- and post-intervention; $p < 0.05$). A total reduction of chest X-rays ordered weekly was also observed (average of 116 vs. 80 per week pre- and post-intervention; $p < 0.01$). The compliance for ordering of chest radiographs increased from a pre-intervention baseline of 40% to an average of 83% ($p < 0.001$). Lastly, the proportion of paired blood culture draws increased from 18 to 58% over a 6-month period ($p < 0.001$).

CONCLUSION. Our structured, process-oriented intervention model improved compliance with evidence based guidelines and reduced inappropriate utilization over a 6-month period. Our methodology for performance measurement and management to implement best practice is applicable to most areas of healthcare.

0670

AN EXAMPLE OF PLURAL DEVICE OF ANALYSIS OF THE MORTALITY IN AN ICU

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OBJECTIVES. The mortality translates the unfavourable outcome and is a major element of the dashboard in an intensive care unit. The raw statistics of deaths are not relevant enough. So the medical team has set up a plural device of analysis to carry a critical glance on the way the patients are taken care, including French regulatory framework and intensivists guidelines. The aim of this communication is to share our experience and contribute to the reflexion about ICU performance measure.

METHODS. 8 items: 1. *Percentage of the deaths*: it is the administrative required data. 2. *Severity of the current disease*: the SAPS II Score is used for all the ICU patients for the valuation of stays in France and allows a comparative approach; however the scale of the distance between predicted versus observed mortality puts the focus on the methodological limits of the tool. 3. *Health status*: autonomy (KNAUSS) and pre-existent diseases (MAC CABE) are determinant for the prognosis. 4. *Length of stay before death*: related to the SAPS II score, it focuses on the admission policy. 5. *Therapeutic limitations*: decided, respectively to the legal procedure, they influence the statistics and the length of stay. 6. *Mortality and morbidity review*: since 2001 every death is analysed, and now according to the recognized method of the national accreditation agency, in order to detect unwanted events and identify their avoidability. 7. *Follow-up after ICU release*: consulting administrative data and phone survey beside familial doctors gives a more global approach of the effective result of the stay and neutralize a special release policy. 8. *Iatrogenic factor for the admission*: used data for risk management and public health.

RESULTS.

1. 15.98%
2. See Table 1

TABLE 1 SEVERITY OF THE CURRENT DISEASE

	Mean SAPS II	Observed mortality (OM)	Predicted mortality (PM)
All patients	44	15.98%	34.8%
Dead patients	71.5	100%	82.6%
Surviving patients	38.5	0%	23%

3. See Table 2

TABLE 2 HEALTH STATUS

MAC CABE SCORE	1	2	3	KNAUS SCORE	A	B	C	D
All patients	92	199	28		50	168	91	10
Dead patients	5	37	9		4	26	19	1
Surviving patients	87	162	21		46	142	72	9

4. See Table 3

TABLE 3 LENGTH OF STAY BEFORE DEATH

Stay length before death	<24	24/48 h	J3 à J7	J8 à J20	>20 J
No of patients/%	10/6%	11/22%	15/28%	12/24%	3/6%
Mean SAPS II	81	81	65	68	53

5. 54.9%
6.
7. in analysis
8. 11%

CONCLUSION. The statistics of deaths examined without enough precision do not inform about medical performance and care. This experimental device allows our team to have an interesting analysis of each case and of local policy. *A complete benchmark approach through shared indicators is required to optimise the reflex ion.*

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0671

CHARACTERIZING THE PROFILE OF RISK OF HOSPITAL MORTALITY IN DIFFERENT ICUS

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INTRODUCTION. We propose a new method to visualize the profile of risk within a subset of patients, e.g. of patients admitted to a specific ICU over a given period of time. Risk adjustment can be based on any score S predicting a dichotomous outcome variable. As an example we further on consider SAPS 3 predicting hospital mortality at admission to the ICU.

MATERIALS AND METHODS. To develop a method compute the profile of risk within a subset of patients we calculate the SAPS 3 value at which the hospital mortality p is predicted inverting the function which predicts the risk of hospital mortality published in Moreno et al. (2007). We call this value SAPS 3_p.

From the subset of patient data in a single ICU (indexed by i) we estimate the risk of hospital mortality p_i(SAPS) in this specific ICU based on a logistic regression model with the SAPS 3 score of the individual patients as the single predictor. This simple model will in general produce reasonable parameter estimates even if the sample sizes in the individual ICUs are rather limited. We then plot the relative ICU-specific risk estimate $r_i = p_i(\text{SAPS}_p)/p$ as a function of p together with its point-wise confidence intervals. Thereby we achieve an appealing graphical presentation of the risk profile within the ICU over the whole span relative to the hospital mortality p estimated from the large SAPS 3 data set together with its variability.

RESULTS. We applied the method to the ICUs in the SAP3 data set and compared the estimated individual risk profiles to those estimated by non-parametric methods. The simple method achieved a satisfactory fit of the ICU-specific relative risks with a tendency of slightly overestimating the relative risk for patients with extremely low risk (and consequently extremely low values of the expected risk in the denominator). We also looked at the results when patients in the very low risk categories are excluded from estimating the ICU-specific risk profile. Truncating the samples at 5 and 95%, respectively of predicted mortality achieved the best results, because it does not truncate too many patients, improves the fit at the low tail and has practically no impact at the high tail.

The graphical distribution of all histograms for the Hosmer–Lemeshow Goodness-of-fit Test, presented as the density of the CHIsqare distribution with 8 degrees of freedom, demonstrates a quite good fit.

CONCLUSIONS. The method presented here for the first time allows the use to have a graphical presentation of the risk profile within the ICU over the whole span relative to the hospital mortality, and not just a point estimate as when using the classical Standardised Mortality Ratio method.

0672

EFFECTS OF ORGANIZATIONAL CHANGE IN THE CARDIAC SURGICAL ICU: COMPARISON INTENSIVIST-LEAD MODEL VERSUS SURGEON-LEAD MODEL

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INTRODUCTION. The practice of cardiac surgery has become increasingly complex and high risk. Increasing complexity of cardiac surgical cases requires a new level of critical care performance. The aim of the study was evaluation of the impact of a newly appointed intensivist on cardiac surgical intensive care unit patient outcomes and quality of care variables.

MATERIALS AND METHODS. We performed observational cohort study with historical controls in eight-bed cardiac surgical intensive care unit (CSICU) in tertiary university hospital. Mortality, ventilation time, length of stay in the CSICU and hospital (LOS) were compared between two 24-month periods, before and after the appointment of intensivist. Data regarding these patients were collected using the department database.

MEASUREMENTS AND MAIN RESULTS. We analyzed 1,646 patients before (first period) and 1,548 patients after (second period) the intensivist appointment. The unadjusted in-hospital mortality decreased from 6.68% (110 patients) in the first period to 4.78% (74 patients) in the second period ($p < 0.01$). The mortality predicted according to EuroSCORE was 8.76 ± 11.3% in the first period and 8.9 ± 12.5% in the second (NS). Mean ventilation time was unchanged—37 ± 119.2 versus 37.7 ± 108.2 h (NS). Mean ICU LOS and mean hospital stay were unchanged—2.8 ± 6 versus 3.1 ± 6.7 days (NS) and 8.8 ± 11.3 versus 8.9 ± 12.5 days (NS). ICU readmission rate decrease from 4.8 to 3.1%. In the very high risk groups (EuroSCORE > 10) mortality decrease from 37.03 to 15.32% ($p > 0.01$). In the group of patients ≤70 years old mortality decrease from 11 to 6.81% ($p < 0.05$). In the low, intermediate and high risk groups (EuroSCORE 0–3, 4–6, 7–10) and in the groups of patients younger than 70 mortality was unchanged.

CONCLUSIONS. The appointment of intensivist-led team model in the cardiac surgical intensive care unit was associated with decreasing ICU mortality, particularly in the very high-risk group and elderly patients. These findings can be interpreted as providing support for the hypothesis that intensivist-driven ICU model may result better outcome.

0673

DISPARITIES IN MANAGEMENT PRACTICES FOR ACUTE CORONARY SYNDROME AT DIFFERENT HEALTH CARE DELIVERY SITES AND IMPACT ON IN-HOSPITAL OUTCOME

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INTRODUCTION. Coronary artery disease (CAD) in contemporary society has afflicted population in an epidemic proportion. The increasing prevalence of CAD is likely to make the situation worse in near future. India and other similar countries have a hospital based disease oriented health care delivery system which is not organized to equity of care and extremely varied care ranging from rudimentary to the best available in the world for the management of Acute coronary syndrome (ACS) are available

OBJECTIVES.

1. To document the management practices of ACS and their impact on in- hospital outcome at different health care delivery sites
2. To document the reasons for disparities in management practices of ACS at different sites
3. To develop package(s) of educational material to address the important disparities in management practices of ACS so as to achieve a specified standard of care at different sites

MATERIALS AND METHODS.

Study design. An interviewer administered questionnaire based cross sectional survey and validation of reported practices vis a vis actual practices by reviewing case records

Subjects. Health care providers (HCP) taking care of patients of ACS and attendants of patients of ACS admitted at sites of study.

Sites. Government, teaching, tertiary hospital, Government, teaching and non teaching, secondary hospital, Private, nonteaching, secondary hospital.

METHODS. HCP of the study sites were interviewed by the investigator and with their permission information was abstracted about current practices for managing consecutive 20 patients with ACS under their care.

RESULTS. Oxygen administration was not guided by oxygen saturation by 35% of HCP. Thrombolysis was done inappropriately by 14%, 95% CL; 6, 26 of HCP. Heparin was used inappropriately by 41%, 95% CL; 28, 55 of HCP.β blockers were used inappropriately by 32%, 95% CL; 20, 46 of HCP. I/V β blockers were inappropriately not used by 39%, 95% CL; 26, 53 of HCP. Nitrates were used inappropriately by 78%, 95% CL; 65, 88 of HCP. ACE Inhibitors were used inappropriately by 35%, 95% CL; 23, 49 of HCP. Pre-discharge risk stratification of patients by HCP varied from 14 to 93%. 0.96% of HCP were aware of recent guidelines for managing patients of ACS. Validation of reported practices showed that the actual appropriate practices were 5–50% lower than reported. Lack of resources (96%) lack of regular updates of guidelines for ACS (91%), lack of trained staff were the main reasons for disparities in management of ACS at different sites. Maximum mortality 21%, 95% CL; 11, 34 and maximum dissatisfaction with treatment 37%, 95% CL; 28, 56 was seen at site where inappropriate practices were maximum. The cost of treatment at various sites varied from Rs3815 $\pm$ 1821 to Rs12923 $\pm$ 4612

CONCLUSIONS. Management practices for ACS at various sites vary despite similar patient characteristics and are associated with significant differences in the in-hospital outcomes. Formulating and applying requisite measures in form of appropriate package(s) can improve survival and cost effectiveness.

0674

LIMITED NETWORKING BETWEEN INTENSIVE CARE UNITS IN SWITZERLAND

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INTRODUCTION. The demographic evolution of the population in our country, the increasing polymorbidity of patients admitted to the hospital and the increasing standard of life challenge intensive care unit (ICU) capacities to admit critically ill patients. Therefore, to optimize ICU bed availabilities, there is an increasing need for networking between large and small ICUs in our country.

OBJECTIVES. To investigate the need and director's willingness of establishing a network of ICUs in Switzerland with regard to patient allocation as well as postgraduate training and continuing medical education (CME) of ICU physicians.

METHODS. A questionnaire containing 19 questions and illustrations of 7 clinical situations was sent to the medical directors of all ICUs accredited by the Swiss Society of Intensive Care Medicine (SSICM). The 19 questions were divided in three parts: the first section was specifically designed to obtain information on the organization and structure of the ICU. The second identified criteria for patients' transfer in several clinical conditions. The third investigated the actual and possible future practice of postgraduate training and CME of physicians employed on an ICU. The survey was voluntarily anonymous.

RESULTS. A total of 92 questionnaires was sent, 28 questionnaires were returned, providing a 30% response proportion. 7 (25%) were small ICUs ($\leq$6 beds), 14 (50%) medium sized ICUs (7–9 beds), 5 (18%) large ICUs ($\geq$10 beds). In two answers (7%), the number of ICU beds was missing.

Most ICUs of small and medium size perform 1–5 patients' transfers per month, large ICUs perform less (<1 per month). 73% of transfers are performed due to medical reasons, which are preferentially acute respiratory failure [acute lung injury (ALI) or acute respiratory distress syndrome (ARDS)] and circulatory shock. In contrast, small ICUs tend to keep post-surgical patients and patients with ALI/ARDS. Large ICUs are willing to accept any kind of pathologies, preferentially patients with circulatory failure and ALI/ARDS. Further reasons for transfer are missing capacity of ICU beds and limited resources with regard to infrastructure and personnel.

Current postgraduate training and CME programs are network based in 85% of all ICUs. Of the small/medium sized ICUs, 42% include a large ICU in their CME network, whereas the remaining are organized within a regional network of small/medium sized ICUs.

CONCLUSIONS. The results of the present survey indicate that networking for patients' care between ICUs is limited and mostly unidirectional from small/medium sized to large ICUs. Conversely, there is considerable networking with regard to postgraduate training and CME of ICU physicians. The fact that patients with ALI/ARDS are preferably kept in small ICUs could have an impact on patient safety.

0675

SURVEY OF ATTITUDES AND BEHAVIORS OF HEALTHCARE PROFESSIONALS ON DELIRIUM IN THE ADULT AND PEDIATRIC INTENSIVE CARE UNIT IN CHINA

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INTRODUCTION. Delirium is a common yet underdiagnosed neuropsychiatric disorder in the intensive care unit (ICU), which is defined as an acute change in mental status or a fluctuating courses, impaired attention and disorganized thinking. Delirium could be caused by a general medical condition or its treatment and contribute to poor short and long term outcomes, but little is known about healthcare professionals' opinions regarding delirium or how they manage it, and no study on professionals' attitudes and behaviors of delirium conducted in China has been.
OBJECTIVE. To assess the medical community's attitudes and practices regarding delirium in the adult and pediatric intensive care unit (ICU) in China.
METHODS. A questionnaire survey was distributed to healthcare professionals including 31 doctors, 75 nurses and 4 respiratory therapists (RT) in the first affiliated hospital of Zhejiang university and the affiliated children's hospital of Zhejiang university between Feb 2009 and May 2009. 110 questionnaires was send to these two ICUs and participants completed 105 of the surveys (95.5% was finished).
RESULTS. Eleven percentages of the respondents thought >50% of their patients experience delirium in ICU. Delirium in ICU was considered a significant or very serious problem in the intensive care unit by 78% of respondents, and underdiagnosis was acknowledged by 56.2%, while, 35.2% showed unaware of the characteristics of delirium. Brain injury, hypoxemia and old age were regard as the leading causes of delirium, and 70.5% respondents ignored the influence of sedative and analgesia therapy on delirium. 80% respondents thought delirium should be treated, but neither regular screening for delirium, nor using a specific tool for delirium assessment was conducted in the two ICUs.
CONCLUSIONS. In present survey, delirium is a poorly aware problem to the healthcare professionals in the adult and pediatric ICU in China. Practitioners using none of a specific screening tool to assess critical care patients for delirium. The results of this survey provide data to draw professionals' attention on the perceived importance and practices of monitoring and treatment of delirium in the ICU in China.
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GRANT ACKNOWLEDGEMENT. None.

0676

LENGTH OF STAY IN NORDIC ICUS

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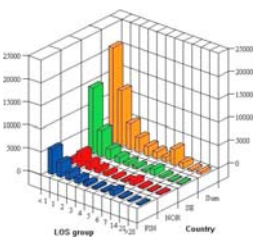
The determinants for length of stay in the ICU (LOS-ICU) are several. The severity of illness in critical ill patients plays a major role, but LOS-ICU may also reflect organisational factors like admission criteria, staffing and availability of intermediate care units. The main goal of this study was to analyze the "normal" variation of LOS in ICUs in Finland, Sweden and Norway.

METHODS. Routinely collected and validated data from three Nordic national ICU registries (Finland, Sweden and Norway) was merged for admissions in year 2006 (n = 53.305). LOS was registered as the number of hours spent in the ICU converted to days. Comparison of LOS was performed with regard to country, age groups and type of hospitals. Analysis was also performed with regard to the further expected LOS defined as mean LOS-ICU for each group minus days already spent in the ICU. Mean and 95% are given for LOS values where needed.

RESULTS. Mean LOS (all admissions) was 3.2 days ranging from 4.77 days (4.62–4.92) in Norway, 3.26 days (3.17–3.35) in Finland and 2.55 days (2.49–2.61) in Sweden. One major reason for this was the different distribution of LOS-ICU groups (shown in the Fig. 1) where both Sweden and Finland had large groups of patients staying <24 h in the ICU. Only 1.1% of all admissions had a LOS above 4 weeks. In the group aged >80 years the mean LOS-ICU was 2.5 days (2.36–2.58) compared to 3.3 (3.25–3.37) days in patients <80 years. LOS-ICU in the university hospitals was 3.5 days (3.46–3.62), in regional/central hospitals 3.1 days (3.01–3.17) and in local hospitals 2.7 days (2.59–2.83).



LOS-ICU in different countries

The expected further LOS at different interval from day 1 to 28 is shown in the Table 1.

TABLE 1 EXPECTED FURTHER LOS-ICU

1 day	2 days	3 days	4 days	5 days	6 days	7 days	14 days	21 days	28 days
3.2	4.0	5.2	6.2	7.0	7.6	8.2	8.8	11.2	14.2

CONCLUSIONS. Most patients have a short LOS-ICU in Nordic ICUs with only 1% defined as long admissions. There are obvious country differences in admission policy to the ICU. Younger patients and patients in University hospital have an increased LOS-ICU.

0677

MORTALITY COMPARISON BETWEEN ICU PATIENTS ADMITTED DURING DAYTIME AND NIGHT SHIFTS

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INTRODUCTION. There is a growing concern among ICU clinicians and hospital managers about patient safety. In this context, issues like budget restraints, shortage of skilled professionals and excessive workload in ICU may put patients admitted on night shifts at risk of worse outcomes. These issues could gain special importance in small private hospitals with low volume of patients and squeezed operating margins. There are controversial data on literature about this topic.

OBJECTIVES. This study is aimed at determining whether mortality rates among ICU patients differ according to the time of ICU admission.

METHODS. We have collected prospectively data on consecutive ICU admissions between April 2003 and July 2007 in our 8-bed unit of a 50-bed private hospital. Patients were grouped according to their time of admission and compared using univariable and multivariable analyses. We have considered nigh shift the period between 18:00 pm and 7:00 am.

RESULTS. There were 1,641 consecutive patients. Of these patients, 677 (41.7%) were admitted at night shifts. The group admitted at nigh shifts were more critically ill according the APACHE II score (9.6 vs. 8.0, $p < 0.001$), stayed at ICU for longer periods (4.3 vs. 3.0, $p < 0.001$), used more supportive procedures like mechanical ventilation (24.2 vs. 15.7%, $p = 0.001$), CVC insertion (29.7 vs. 22.3%, $p = 0.001$), parenteral nutrition (8.9 vs. 5.8%, $p = 0.018$), developed more nosocomial infections like surgical site infections (1.9 vs. 0.5%, $p = 0.007$) and had a higher in-hospital mortality (10.2 vs. 7.4%, $p = 0.043$). The unadjusted odds ratio for night shift admission and in-hospital mortality was 1.43 (95% confidence interval, 1.01–2.02) but when we have adjusted for initial disease severity the effect of the time of ICU admission on mortality disappeared.

CONCLUSIONS. In our ICU, night shift admissions were not associated with higher mortality.

0678

COMPLIANCE WITH FAST HUG EVIDENCE BASED PRACTICES IN A GENERAL ICU

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INTRODUCTION. The application of Fast Hug mnemonic (Feeding, Analgesia, Sedation, Thromboembolic prophylaxis, Head-of-bed elevation, stress Ulcer prevention and Glucose control) may help improve the quality of care received by ICU patients. It can be used as a checklist and helps the multiprofessional team to deliver evidence based care at the bedside.

OBJECTIVES. The aim of this study was to determine the proportion of critically ill patients meeting Fast Hug evidence based practices.

METHODS. The study was conducted in a 8-bed medical and surgical ICU of an private hospital. Between january 2006 and December 2008 we collected prospectively data from every patient admitted to our ICU. We considered the following indicators to define compliance to Fast Hug : early administration of enteral nutrition (48 h), proportion of 12 h-shifts with pain classified as moderate or intense during nursing assessment, proportion of wake-up call (sedation vacation) practice in mechanically ventilated (MV) patients, pharmacological or mechanical prophylaxis of deep venous thrombosis for at risk patients, proportion of ventilator-days maintaining a ≥30-degree head-of-bed (HOB) elevation, pharmacologic stress ulcer prevention for patients on MV and proportion of patient-days receiving enteral or parenteral nutrition support (nutrition-days) with glucose levels above 170 mg/dl.

RESULTS. We admitted 737 consecutive patients (417 male), the mean age was 53.8 years, the mean APACHE II score was 10.5, ICU LOS was 4.6 days, SMR was 0.8 and overall ICU mortality was 10.3%. Compliance data are shown in Table 1.

TABLE 1

Indicator (for eligible patients)	Results (%)	Standard (%)
Early administration of enteral nutrition	75	100
Proportion of 12 h-shifts with pain	4.5	zero
Proportion of wake-up call practice	43	80
Prophylaxis of deep venous thrombosis	70	90
≥30-degree HOB elevation	99	97
Stress ulcer prevention	98	95
Hyperglicemia on nutrition support	32	25

CONCLUSIONS. These preliminary data show there is a variation in translating clinical evidence into clinical practice and that some practices gain more acceptance than others among ICU staff. We need to identify the drivers of clinical acceptance in order to deliver quality care for critically ill patients.

0679

PROMOTING INFECTION CONTROL IN THE ICU USING A TARGETED 'PUSH-AND-PULL' INTERVENTION

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INTRODUCTION. Working with quality improvement in health care is of increasing importance. Many interventions are of the type "push", an activity which focuses on a goal-directed project that often leads to changes in behaviour on a short term basis. "Pull" interventions that focus on follow up, feedback of results, review and audit of the unit are rarer.

OBJECTIVES. To assess if a "push-and-pull" intervention targeted at nosocomial infections in the ICU could promote changes in practices that were stable over time.

METHODS. The intervention *"push"* was a 1-day local session offered to 30 Swedish ICUs of which 12 could participate. The subject was infection control practices, particularly focusing on diagnosis and prophylaxis of nosocomial infections in the ICU. New methods for diagnosing ventilator-associated pneumonia (VAP) and intravascular device (IVD)-related infections were introduced. These were quantitative endotracheal aspirates (QEA) for VAP and time to hub-positivity for diagnosing intravascular device (IVD)-related infections in situ. A general overview of how to improve compliance with infection control measures to reduce nosocomial infections was also discussed interactively. Teaching was planned in concert with a group of experts but undertaken by only one of us (CAÖ).

The next intervention "*pull*" started with a letter to the physician-in-charge at all units 5 months after the 1-day session. It was a reminder of what had been discussed during the visit and a promotion of a questionnaire that would be sent 6 months after the visit. The questionnaire focused on what changes in diagnostic tools and registration that actually had been performed since the intervention.

RESULTS. Compliance to infection control hygiene measures was a focus in 10/12 ICUs already from the start, and the remaining 2 ICUs started a programme after the "push" session, all units said that motivation to work with these issues had increased after the visit. QEA as a complement to other microbiological samples, was used by 4/12 before and 6/12 six months after the session. Time to hub-positivity to diagnose IVD related infections was used by 3/12 ICUs before and 7/12 after the session. The majority of the units that had not started to use the two methods yet, had started collaboration with their laboratories to implement these techniques.

CONCLUSION. This pilot study indicates that a targeted "push-and-pull" intervention could be a method to reach desirable changes in order to improve infection control. Periodically follow-ups are needed during a period of 2–5 years to assess if changes are sustained, or if additional interventions of type "push-and-pull" are needed.

GRANT ACKNOWLEDGEMENT. The Swedish Intensive Care Registry (SIR) and the Swedish strategic programme against antibiotic resistance (Strama).

0680

HAND HYGIENE FREQUENCIES IN INTENSIVE CARE UNIT, KING FAHAD HOSPITAL HOFUF, SAUDI ARABIA

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BACKGROUND. Hand hygiene is a basic for the control of nosocomial infection. Our study revealed the poor compliance with hand hygiene in health care workers. We attempted to enhance compliance with hand hygiene by implementing education, training, and performance feedback.

METHODS. We monitored the overall compliance with hand hygiene during routine patient care in intensive care unit of King Fahad Hospital Hofuf, Saudi Arabia, for compliance of hand hygiene before patient examination, after patient examination and after any procedure on patient. This was done before implementation of a hand hygiene education, training, and performance feedback program. Observational surveys were done from in the ICU for 6 months in 2007.

RESULTS. We observed 2,286 Opportunities for hand hygiene in ICU Patient care. Compliance to hand washing was 31.1%. Used Hand hygiene 31.1% As indicated before or after (overall) 4.1% As indicated before doing any procedure 40.8% As indicated after doing any procedure 54.3% As indicated after removing gloves

CONCLUSION. Overall compliance of hand hygiene in ICU is low and a program consisting of focused education and frequent performance feedback may produce a sustained improvement in compliance with hand hygiene.

0681

AN AUDIT OF IV PARACETAMOL USAGE ON THE INTENSIVE CARE UNIT (ICU) IN AMNCH

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AIMS/OBJECTIVES.

- To undertake an audit of IV paracetamol usage on ICU with respect to appropriateness and cost implications of it's use.
- To carry out a survey of ICU nurses regarding current practice with respect to paracetamol administration.

METHODOLOGY. The study was conducted prospectively from mid March to April 2008

- Each patient's prescription chart was reviewed on each visit to ICU and the number of doses of IV paracetamol received in the preceding 24 h was recorded.
- Medical and nursing notes were also reviewed for fluid, mobility and feeding status

A questionnaire was designed to assess nurse practice with respect to paracetamol administration.

RESULTS. Audit.

In total, 86 doses of IV paracetamol were administered during the data collection time frames reviewed. Of these, 25 (29.1%) were deemed appropriate, i.e. the patient was receiving no other medicines by a non-IV route. 61 doses *(70.9%) were deemed inappropriate*, i.e. the patient was receiving their regular medications via a non-IV route (NG/PO). No patient was written up for all four routes, i.e. IV/NG/PO/PR and no patient received paracetamol via the PR route.

Questionnaire

23 questionnaires were completed by ICU nurses. If paracetamol was written up for all routes (IV/NG/PO/PR), 95.7% of respondents agreed that they would change the route of administration as the patient's condition changed.

If a patient was nil by mouth, 30.4% of nurses would administer paracetamol via the PR route, 69.6% would not.

IV Paracetamol use has a high opportunity cost (1 g QDS IV for 24 h = €22.08, 1 g QDS PO for 24 h = €0.08), therefore the inappropriate prescription and use of IV paracetamol must be addressed.

RECOMMENDATIONS.

- Present results back to relevant stakeholders (nurses and doctors) including a poster format for ICU.
- Achieve buy-in from all stakeholders and educate them re: cost savings.
- Consider making soluble sachets stock on ICU to facilitate NG administration.
- To implement changes and review usage of IV paracetamol in ICU in the future to see if usage has decreased and to continue the audit cycle.
- To evaluate appropriateness of IV paracetamol use hospital-wide in AMNCH.

0682

LONG-STAY CRITICALLY ILL PATIENT: A COMPLEX PROBLEM IN THE DEVELOPING COUNTRY

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INTRODUCTION. In our country the number of intensive care (ICU) bed per head of population is much lower. The pressure on ICU bed is considerable [1]. The goal of this study was identify characteristics and outcomes of these patients in ICU for a long time stay.

METHODS. Data from all patients admitted to our a 10-bed ICU were collected retrospectively from consecutive adult patient requiring at least 30 days of ICU admitted between January 2004 and December 2008.

We recorded details of the course and compared survivors and non-survivors: age, diagnosis, total number of ICU days, duration requiring invasive ventilator support (Vm) with or with out renal replacement therapy, severity illness scores: [APACHE II], MODS and Omega score [2] and outcomes.

RESULTS. During 5 years study period there were a total of 1,619 patients admitted in our ICU. 78(4.8%) of them met the inclusion criteria.

The mean age was 40.3 years [16–75]. The median duration of stay was 47 days [range 31–135]. The reason for admission was medical diseases 40 (51.3%) patients: 35 of them have a neurological diseases. Post operative admission concerned 38 (48.7%) patients: 8 for them obstetrical surgery, 25 after neurosurgery, 3 post orthopaedic surgery, 2 post cardiac surgery. Duration of Vm was 28.2 days [range 6–80], APACHE II was 17.5 [range 9–34], initial MODS was 5[range 2–16] and Omega score 560.9 [range 277–1645]

The outcomes of patients on ICU was 36 (46.1%) survivors and 42 (53.8%) died the characteristics was represented in Table 1.

Survivors mean [range] versus Patients Non survivors

Age (years)41[17–67] versus 40[16–75]

Apache II 16.3[9–28] versus 18.5[7–34]

Initial MODS 4.7 [2–8] versus 5.5 [4–16]

Medical diseases 20 versus 20

Post operative illness 16 versus 22

Dialysis or Apheresis 4 patients versus 8

Vm per day 19.1 [6–49] versus 36 [6–80]

Omega score 425.8 [277–854] versus 676.6 [296–1545]

ICU stay (days) 43 [34–135] versus 51 [31–135]

CONCLUSION. One predominant factor in long stay ICU and outcomes in the unit was occurrence of ARDS, acute renal failure, severity neurological disabled and acquired critical illness polyneuromyopathy significantly contributes to explained difficulty weaning from Vm and their discharge because in our country we have not hospital or unity intermediate care or step down units for high intensity patients not requiring Vm or available chronic ventilator units

Short- and long-term outcomes: 0683–0696

0683

VALIDATION OF THE SABADELL SCORE

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In the Sabadell score, the intensivist in charge of the patient assigns at ICU discharge one of the following scores: good long-term prognosis (0 points), poor long-term prognosis (>6 months) with unlimited ICU readmission (1 point), poor short-term prognosis (<6 months), with debatable ICU readmission (2 points), and death expected during hospitalization with ICU readmission not recommended (3 points). Sabadell score has been shown to be useful to predict hospital post-ICU mortality. Although increasingly used, Sabadell scoring is subjective; inter-rater agreement has not been tested previously, and has not been externally validated.

In an 8 bed polyvalent ICU of a 210 bed hospital, Sabadell score was assigned to all patients discharged from the ICU from 1 December 2008 to 31 March 2009 by his physician in charge (rater A). After completion of this period, a second rater (rater B), blinded to the scoring from rater A, assigned independently his own Sabadell score to all patients after reviewing clinical history and patient charts. All discharged alive patients (162) were included.

Prevalences of the individual scores were different ($P < 0.001$), and diminished from 0 to 3 for both raters. This marginal heterogeneity poses limitations to the interpretation of kappa indices. There was a good agreement as measured by means of kappa index with quadratic weights (kappa 0.68; 95% CI: 0.59–0.78; $P < 0.001$ for kappa > 0; $P = 0.046$ for kappa > 0.6). For individual scores, agreement varied widely (non-weighted kappa for individual scores, K0: 0.61; K1: 0.23; K2: 0.13; K3: 0.47). Global percentage of crude agreement was 59.3%; individual crude agreements were: 80.2% for score 0, 67.3% for score 1, 80.2% for score 2, and 90.7% for score 3. Positive and negative agreements varied widely between the four possible scores.

Due to the subjective nature of the Sabadell score and the limitations of the kappa indices, we hypothesized that, as it measures a continuous latent trait ("risk of death estimated at ICU discharge"), a polychoric correlation coefficient can be a better agreement estimator. R* correlation coefficient was 0.83 ($P < 0.001$), with good fit, suggesting that discrimination was good for both raters, and in close agreement for the latent trait. This high correlation with only moderately good agreement for some categories suggest the necessity of increasing intensivist training, and/or to improve possible inconsistencies of the score itself.

CONCLUSION. Inter-rater global agreement for Sabadell score is good, but individual categories are less reliable. The Sabadell score is better viewed as measuring a latent trait, and ICU physicians with adequate training show excellent reliability in estimating the risk of death at ICU discharge, despite only moderate agreement in individual scores, probably reflecting inadequate tresholds in the score. Further data are needed before definitive validation of the Sabadell score.

0684

SABADELL SCORE TO PREDICT POST-ICU DISCHARGE HOSPITAL MORTALITY

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Sabadell score was created to aid predicting vital prognosis and allocating resources after ICU discharge, but its capacity to predict alone the hospital post-ICU mortality is limited. No study has addressed the relative importance of other prognostic factors besides Sabadell score, and no model has been suggested to predict hospital mortality at ICU discharge including Sabadell score.

The objective of this study was to assess the capacity of Sabadell score to predict the hospital post-ICU mortality, and create a multivariate predictive model, as parsimonious as possible, able to improve the predictive capacity of Sabadell score alone. All 162 patients surviving ICU admission during a 4-month period in an 8 bed ICU community hospital were included. 11.3% of patients died in the hospital after ICU discharge. Sensitivity and specificity of Sabadell score "3" to predict hospital post-ICU mortality were both 72.2%. In order to improve this predictive ability, a multivariate model was builded, including three admission-related variables (SAPS-3, age and a dichotomic variable: "any explicit therapeutic limitation stated at ICU admission", and one discharge-related (Sabadell score). In univariate analysis, all four variables were related to hospital mortality, and all three admission-related variables were related to Sabadell scoring at discharge (as assessed by ordinal logistic regression). A logistic model was builded to predict hospital mortality, including SAPS-3, age, therapeutic limitation at admission and Sabadell score. This model was highly significant and predicted very accurately hospital mortality. Individual associations were: Sabadell: OR 7.07, 95% CI 2.30–21.76, $P = 0.001$; SAPS-3: OR 1.1, 95% CI 1.04–1.20, $P = 0.002$; age: OR 1.07, 95% CI 0.99–1.14, $P = 0.081$; and therapeutic limitation: OR 1.35, 95% CI 0.19–9.49, $P = 0.762$. After deleting therapeutic limitation at admission, the reduced model retained all its predictive ability. Percentage of correct predictions was 94.8%. This reduced model had excellent calibration (Hosmer–Lemeshow goodness of fit chi-square: $P = 1.000$) and discrimination (AUC ROC 0.965).

This simple model including only SAPS-3, age and Sabadell score is the most accurate model to date to predict post-ICU mortality at ICU discharge, and could be useful to plan post-ICU care when combined with the preferences of patients and families and available resources. This model requires external validation in a greater number of patients and different ICU before its application.

0685

WARD MORTALITY AFTER ICU DISCHARGE: A MULTICENTER VALIDATION OF THE SABADELL SCORE

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CONTEXT. Tools for predicting post-ICU patients' outcome are scarce. A single-center study showed that the Sabadell Score classified patients into 4 groups with clear-cut differences in ward mortality.

OBJECTIVE. To validate the Sabadell Score using a prospective multicenter approach.

DESIGN. Prospective multicenter cohort study.

SETTING. Thirty-one ICUs of varied size and affiliation in Spain.

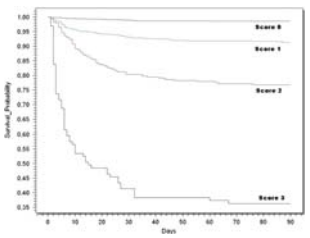
PATIENTS. All patients admitted in the 3-month study period. We recorded
(a) at ICU admission: age, sex, severity of illness, and do-not-resuscitate orders,
(b) during the ICU stay: ICU-specific treatments, ICU-acquired infection, and acute renal failure, and
(c) at ICU discharge: the Sabadell Score.

MAIN OUTCOME MEASURE. Hospital survival. Statistical analyses included one-way ANOVA and multiple regression analysis with ward mortality as the dependent variable.

RESULTS. We admitted a total of 4,132 patients (mean age 61.5 ± 16.7 years) with median predicted mortality of 14 (7.36%); 545 patients (13%) died in the ICU and 3,587 (87%) were discharged to the ward. At ICU discharge, patients were classified on the Sabadell Score as: Score 0 *"Good prognosis"*: 2,422 patients (67.5%), Score 1 *"Long-term poor prognosis"*: 724 (20.2%), Score 2 *"Short-term poor prognosis"*: 340 (9.5%), and Score 3 *"Expected hospital death"*: 99 (2.8%). Overall ward mortality was 6.7%; ward mortality was 1.5% in patients with Score 0; 9% in those with Score 1; 23% in those with Score 2, and 64% in those with Score 3.

Variables associated with ward mortality in the multivariate analysis were: Predicted risk of death (OR 1.016 [1.009, 1.023]), ICU readmission (OR 5.9 [3.8, 9.1]), Sabadell score 1 (OR 4.7 [2.9, 7.5]), Sabadell score 2 (OR 15.7 [9.8, 25.3]), and Sabadell score 3 (OR 107.2 [58.7, 195.9]).

CONCLUSION. We confirm the ability of the Sabadell Score at ICU discharge to define 4 groups of patients with very different likelihood of hospital survival (Fig. 1)



0686

POST-ICU SURVIVAL PROGNOSTIC SCALE

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INTRODUCTION. ICU survival is a quality indicator for ICU performance. But what happens once they are in a general ward? There few studies about that, and some show mortality rates Post-ICU above 25%. There are prognostic scores for survival, built with data gathered in the first hours-days of the stay that do not take in account comorbidities produced in ICU (tracheostomy, polineuropathy, parenteral nutrition, …). It is necessary to develop new scores based on data available at the end of ICU to identify those patients that could benefit of a follow-up program after ICU.

OBJECTIVE. To identify a set of variables at ICU discharge that justifies to implement a follow-up program or discharge to semicritical care units.

METHODS. We study consequitives patients discharged from ICU during April–June 2008. We register Sabadell Subjective Scale (SSE, group 1: good vital prognosis; group 2: poor prognosis at medium term or >1 year and readmission in ICU not-limited; group 3: poor prognosis at short term or <1 year and readmission in ICU debatable; group 4: death likely in the current admission), origin, predicted inhospital mortality according to APACHE-II, risk factors associates with bad prognosis (mechanical ventilation, parenteral nutrition, vasoactive drugs, tracheostomy, renal failure, nosocomial infections), readmission and vital status at hospital discharge and 60 days.

RESULTS. We evaluated 245 patients. Age (mean ± standard deviation and range) 63.7 ± 14 years (20–89); males 65.9%; origin on admission was Emergency Department in 61%, hospital wards 18.3%, surgery theatre 16.3%. Intra ICU mortality rate was 8.9% ($n = 22$), in ward post ICU 17 (9%) and at day 60 7.6% ($n = 17$). SSE in ICU survivors showed good prognosis (group 1) in 61.9% ($n = 138$), poor prognosis in long term (group 2) 27.8% ($n = 62$), poor prognosis in a short term (group 3) 6.7% ($n = 15$), and no survival to hospital admission (group 4) 3.6% ($n = 8$). In following the table we compare some variables according to prognosis evaluation and survival after ICU discharge.

CONCLUSIONS. Patient with poor prognosis are characterized by an ICU stay longer than 7 days, predicted mortality according to APACHE-II around 50% and more bad outcome risk factors (comorbidity, complications or therapeutic support), to keep in ward with tracheostomy significantly increases risk of death.

0687

EVALUATION OF PATIENT OUTCOMES AT 6 MONTHS IN ICU

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INTRODUCTION. Extended follow-up of survivors of ICU treatment has shown many patients suffer long-term physical and psychological consequences that affect their health-related quality of life (HRQoL).The crucial need to measure clinical outcomes patient centred has been the focus of several studies.

OBJECTIVES. The present study has two objectives: measure clinical patient outcomes of survivors of critical illness in our ICU concerning to HRQoL, Impairment, Disability, and Handicap; evaluate and report the patient's needs.

METHODS. Data was collected from the prospective Follow-Up Registry 6 months after the discharge. We assessed these variables: HRQoL was measured by the EuroQoL (EQ-5D); anxiety and depression was measured by the Beck and Zung tests; and post traumatic stress disorder (PTSD) symptoms was measured by the PTSS-14; handicap was measured by Extended Glasgow Outcome Scale (GOSE).

RESULTS. We found depression in 38%, anxiety in 50% and PTSD risk in 13% of the survivors. When we measured handicap with GOSE, 33% patients were dependent from others and 40% recovered completely. In regards to HRQoL there were no problems in mobility, self-care, usual activities, pain or discomfort, anxiety/depression in 52, 64, 37, 51 and 48%, respectively. 50% of the patients perceived current health state worse than before ICU stay.Median EQ-VAS was 60 (IQR 50–80) and median EQ-VAS index was 67 (IQR 48–91). We orientated patients to others specialities in 42% (21% to psychiatry) 0.60% of the survivors did not return to previous job or usual activities.

CONCLUSIONS. Knowledge of the prevalence of physical and psychological morbidity in our ICU survivors was important because this data generated models of causality, prognosis and possible interventions dependent on this accurate determination of prevalence.

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0688

DETERMINANTS AND OUTCOME OF INTENSIVE CARE UNIT ADMISSION OF VERY ELDERLY PATIENTS IN FRANCE: A MULTICENTER COHORT STUDY

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BACKGROUND. Increasing numbers of very elderly patients are requiring intensive care. Few studies have examined the determinants and benefits of intensive care unit (ICU) admission of patients over 80.

STUDY DESIGN AND PARTICIPANTS. Prospective observational study of all patients over 80 possibly qualifying for ICU admission who presented to the emergency department of 15 hospitals in the Paris (France) area during a 1-year period.

METHODS. The outcome measures were ICU eligibility, as assessed by the ED and ICU physicians; in-hospital mortality; and vital and functional status 6 months after the ED visit. We examined the criteria that determine ICU eligibility of patients over 80; inter-hospital variability of ICU eligibility; and the impact of ICU eligibility on short-term and mid-term vital and functional outcome.

RESULTS. 2,646 patients (median age 86 years; interquartile range 83–91) were included in the study, of whom 12.4% were deemed eligible for ICU admission. Nine eligible patients were not admitted to an ICU, and 7 patients who were not considered eligible were finally admitted to an ICU. The real ICU admission rate was 12.4%. The overall in-hospital and 6-month mortality rates were, respectively, 27.2 and 50.7%.

At 6 months, 57.5% of the patients had died or had a functional deterioration. The ICU eligibility rates ranged from 5.6 to 38.8% across the participating centers, and this variability persisted after adjustment for patient characteristics.

ICU eligibility was not significantly associated with either hospital or 6-month outcome in a model that predicted outcome.

CONCLUSIONS. In France, the likelihood that a very elderly person will be admitted to an ICU varies widely from one hospital to another. It is not obvious that outcome were affected by ICU admission.

0689

THE EFFECT OF AUTOMATIC WEANING FROM MECHANICAL VENTILATION ON QUALITY OF LIFE—PRELIMINARY RESULTS OF A ONE-YEAR-FOLLOW-UP STUDY

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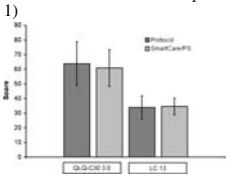
INTRODUCTION. Automatic weaning from mechanical ventilation is gaining increasing interest. Several clinical trials have shown that the use of automatic weaning is safe and may have beneficial effects on the duration of mechanical ventilation [1, 2]. The quality of life of patients subjected to automatic weaning has not been studied so far.

OBJECTIVE. To determine whether automatic weaning with SmartCare/PS (SC, Dräger Medical AG & Co. KG, Lübeck, Germany) compared to protocollized weaning influences quality of life.

METHODS. Patients were systematically followed-up 1 year after being included into a randomized controlled trial investigating the effect of automatic weaning with SC on total ventilation time compared to a weaning protocol [1] (clinicaltrials.gov ID00445289). Quality of life was measured using the European Organization for Research and Treatment of Cancer (EORTC) QLQ-C30 3.0 questionnaire including the lung module LC13 [3]. Statistical analysis was performed using the Mann–Whitney test. A p value <0.05 was considered statistically significant.

RESULTS. 232 of the 300 initially included patients were already followed-up. Overall mortality rate was 29.7% ($n = 89$). 127 of the 143 available patients gave consent to fill out the questionaire. 81 (63.8%) questionnaires were sent back to the study site. QLQ-C30 3.0 score was 64 ± 15 ($n = 43$) in the protocol and 61 ± 13 ($n = 37$) in the SC group ($p = 0.42$) (Fig. 1). LC 13 score amounted 34 ± 8 in the protocol compared to 35 ± 6 in the SC group ($p = 0.59$). (Figure 1)



CONCLUSION. Our preliminary data indicate that automatic weaning does not influence quality of life after 1 year when compared with protocol-driven weaning. The study design did not allow us to measure quality of life before randomization.

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0690

THE IMPACT OF EVENT SCALE IS NOT EFFECTIVE IN DIAGNOSING POST TRAUMATIC STRESS DISORDER IN SURVIVORS OF CRITICAL ILLNESS

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INTRODUCTION. Patients who survive critical illness may develop post traumatic stress disorder (PTSD). The prevalence of PTSD in critically ill patients is approximately 22% [1]. There are many diagnostic tools to diagnose PTSD such as the impact of event scale (IES) which is frequently used in critically ill patients [1]. In a prospective follow-up study we evaluated whether IES was indeed effective in diagnosing PTSD in survivors of critical illness visiting an intensive care follow-up clinic.

OBJECTIVES. Patients admitted to our general ICU in 2008 and who stayed for more than 24 h were invited to visit our follow-up clinic.

Methods. 6 months after hospital discharge patients received an invitation including a questionnaire containing hospital anxiety and depression scale (HADS) and IES. Those with psychiatric symptoms were given the possibility to visit our psychiatric consultation clinic.

RESULTS. We invited 117 patients. 43 patients had no complains and had no need to visit the clinic, 16 patients did not show at their appointment. 58 patients returned their questionnaire and visited the follow-up clinic. Results of the HADS and IES are shown in the Table 3. Patients were referred to a social worker and 9 patients to a psychiatrist. After psychiatric consultation patients were diagnosed with an adaptive disorder (4), depression (1), grief disorder (1) and cognitive dysfunction (1). Two patients did not show at their appointment. No PTSD was diagnosed (Table 1).

TABLE 1 PSYCHIATRIC SYMPTOMS

	Number of patients (%) N = 58
IES>26	16 (28%)
IES>19	24 (41%)
HADS depression >8	13 (22%)
HADS anxiety >8	16 (28%)
Patients referred to a psychiatrist N = 9 (mean ± SD)	
IES	54 ± 22
HADS depression	10 ± 5.5
HADS anxiety	12 ± 4.7

CONCLUSION. In our evaluation a positive IES (score >26) did not indicate a diagnosis of PTSD. Referral to a psychiatrist is needed to confirm the diagnosis. Using the IES in survivors of critical illness as a diagnostic tool overestimates the incidence of PTSD.

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0691

METHODOLOGICAL COMPARISON OF TWO GENERIC HEALTH-RELATED QUALITY OF LIFE INSTRUMENTS (EQ-5D AND 15D) IN INTENSIVE CARE AND HIGH-DEPENDENCY UNIT PATIENTS

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PURPOSE. Within intensive care medicine, the EQ-5D has been recommended as the preferred generic preference-based HRQoL instrument although comparisons between different preference-based HRQoL instruments are lacking. Our aim was to compare whether two generic HRQoL instruments (EQ-5D and 15D) produce comparable results in intensive care (ICU) and high-dependency unit (HDU) patients.

METHODS. Information on HRQoL was obtained with both instruments from 929 patients at 6 and 12 months after treatment at an ICU or HDU.

RESULTS. The HRQoL scores varied according to the instrument used and their distributions were quite different. Compared to the 15D the EQ-5D had some problems, namely an ill-behaved distribution of scores with a remarkable ceiling effect and relatively poor sensitivity to detect change. On the other hand 15D may overestimate the HRQoL of patients with severe disability.

CONCLUSION. Our findings challenge the recommendation to use the EQ-5D as the preferred HRQoL instrument in studies dealing with critically ill patients and warrant further comparative studies. Of note, the choice of the HRQoL instrument may have a substantial effect on cost-utility results obtained with different instruments.

0692

QUALITY OF LIFE AFTER CONTINUOUS RENAL REPLACEMENT THERAPY: PRELIMINARY RESULTS OF A RETROSPECTIVE SURVEY IN CRITICALLY ILL PATIENTS

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INTRODUCTION. Acute renal failure (ARF) is a serious complication of critically ill patients associated with an elevated mortality and relevant financial expenses of intensive care unit (ICU) services. Only limited data are available on outcome in ICU patients requiring continuous veno-venous hemodiafiltration (CVHDF). Although the estimated mortality rates at 1 year following hospital discharge range from 57 to 78% [1] it may be important to evaluate quality of life in these patients. Aim of this survey was to assess mortality and quality of life in ICU patients requiring CVHDF for ARF.

METHODS. Patients with CVHDF during a ICU stay (January 2006–December 2007) were contacted by telephone 1 year after their discharge. A structured interview was performed in order to assess quality of life using the validated psychometric SF-36 health survey. Norm-based scoring of the SF-36® profile (transformed to a mean = 50 ± 10) was analysed considering patient related data at admission (i.e. age, diagnosis, SAPS, APACHE II), indication of CVHDF (i.e. aetiology of ARF), duration of CVHDF and mortality (ICU and 1-year). Data were obtained from the hospital main data base. T-test and χ^2-test were performed for subgroup analysis. Multiple regression analysis was done in order to identify risk factors related to ICU/1-year mortality and reduced quality of life. $P < 0.05$ was considered significant. Data are presented as mean ± SD.

RESULTS. A total of 3,929 patients received ICU treatment during a 2-year period (mortality rate = 3.7%). 147 patients (3.7%) undergoing CVHDF were identified (general surgery: 43 [29.3%], cardiac surgery: 52 [35.4%], internal medicine: 52 [35.4%]). Mean age was 68.4 ± 14.1 years, SAPS and APACHE II were 44.9 ± 16.3 and 21.1 ± 6.3, respectively. ICU length of stay was 13.1 ± 12.7 days, duration of CVHDF was 6.5 ± 7.4 days. Main indications for CVHDF were ARF during septic shock (55/147; 37.4%) followed by ARF due to low cardiac output (45/147; 30.6%). Total ICU and 1-year mortality rate were 40.11% (59/147) and 57.1% (84/147), respectively. There was no significant difference of ICU and 1-year mortality between sepsis and low output patients or other subgroups. "Sepsis", SAPS < 45 and APACHE II < 21 were significant predictors of mortality. 49 patients (77.7%) responded to the questionnaire: Norm-based SF-36® physical and mental health components ranged from 38.0 ± 13.9 to 49.4 ± 10.6, physical and mental component summary (PCS and MCS) for the total patient population was 41.0 ± 9.4 and 49.9 ± 9.9, respectively. PCS and MCS did not significantly differ for different subgroups, no significant risk factors for reduced quality of life could be evaluated.

CONCLUSION. These preliminary results reveal a high ICU and 1-year mortality rate in patients after CVHDF treatment for ARF. However, only moderate limitations with respect to quality of physical and mental health in survivors could be observed.

REFERENCE. 1. Acta Clin Belg Suppl 2007;(2):337–340.

0693

THE GUILLAN-BARRÉ SYNDROME EFFECTS IN THE QUALITY OF LIFE AFTER DISCHARGING ICU

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INTRODUCTION. There are some patients with Guillan–Barré Syndrome (GBS) that require intensive care, either owing to the accentuated progression of their clinic history or because of the evolution towards acute respiratory failure. Most of the times, there are deep sequelae that cause impact on the quality of life (QOL) of those patients. There is no specific score for the assessment of physical and/or motor inability in GBS patients.

OBJECTIVE. Assess the QOL of GBS patients admitted at ICU, after hospital discharge, utilizing the SF-36 and the Barthel Index.

METHODS. Through a review of patient records, GBS incidence in the population of admited patients at the ICU of Hospital Estadual do Grajaú in the period from April 2005 to October 2008 was perceived and a study file was elaborated with demographic data referring to the ICU period. For the patients' follow, telephone contact was established and after consent was granted, those who agreed responded to SF-36 and Barthel Index questionnaires. Telephone contact was not possible only in one patient. Additionally, the professional activity of the patient was evaluated before and after the disorder.

RESULTS. In this sample, seven patients presented a GBS diagnostic, reflecting 0.5% of the total group. Out of the seven patients, six presented previous infections. The mean average ICU length of stay period was 14.4 days. Three patients required mechanical ventilation (42.8%). Tracheotomy was performed in two patients. All of them were supplied with immunoglobulins. The evaluation report results as per the Barthel Index and the SF-36 are on Tables 1 and 2, respectively.

CONCLUSION. GBS patients undergo impact in QOL, although there was a considerable physical recovery after a period of 1–2 years. Results may help doctors to be aware that a careful neurological exam may be complemented with the opinion of their patients regarding their QOL.

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LONG-TERM EVALUATION OF CRITICAL CARE PATIENTS - PRELIMINARY RESULTS

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INTRODUCTION. Functional status of individuals is a marker of quality of life. It is important to evaluate long term follow up from critically ill patients principally from those that leave the intensive Care Unit (ICU) and come back to society.

OBJECTIVE. To assess the Follow up of survivors from two general ICU at least 18 months after ICU discharge and to evaluate factors associated with survival or death.

METHOD. We analyzed all patients admitted in two general ICU during 1 year. During admission all descriptive data related to ICU hospitalization, including SOFA, APACHE II and TISS scores, were collected. In a second moment (18–46 months after discharge from ICU) a telephone interview with patients or their responsible was done. This interview evaluated if patients were still alive and assessed the functional status using the Karnofsky scale and the Activities for Daily Living (ADL) scale.

RESULTS. From a total number of 1219 patients, 76.1% ($n = 928$) were discharged from ICU and 84.4% ($n = 783$) left the hospital. 26.3% ($n = 206$) died before the interview that occurred on average 27 months (±9 months) after discharge from ICU. 34 subjects refused to participate and 35 were not found. Therefore, 506 subjects answered the interview, 18% ($n = 91$) of them being evaluated before 24 months and 82% ($n = 415$) being still alive after this period. Comparing your current health condition of the previous hospitalization in the ICU, the perception of the subjects was that 34% ($n = 174$) felt almost equal, 34% ($n = 173$) it was better and 31% felt is worse ($p > 0.05$). From all patients 48% ($n = 584$) used mechanical ventilation (MV) having a survival rate in 24 months of 26.4% ($n = 154$). Renal replacement therapy (RRT) was used in 150 subjects, which survival rate at the 24th month was 20% ($n = 30$). Survivors were younger (61 years ± 18 vs. 6 years ± 7, $p < 0001$). APACHE II score was lower in survivors (12.55 ± 7.44 vs. 18.97 ± 8.88, $p < 0001$). Sepsis was diagnosed in 25.7% ($n = 313$) having a death rate in 24 months of 80% ($n = 252$).

CONCLUSION. This preliminary evaluation indicated that factors as MV, RRT APACHE score and sepses are associated with higher mortality in ICU. A great number of patients are still alive in 24 months. More analysis is needed for greater consistency of data.

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LONG-TERM OUTCOME AFTER CARDIAC ARREST TREATED WITH THERAPEUTIC HYPOTHERMIA: RESULTS FROM THE SWEDISH INTENSIVE CARE REGISTRY

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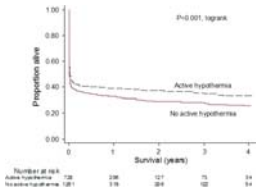
INTRODUCTION. Clinical application of therapeutic hypothermia after cardiac arrest has rapidly become accepted although evidence from high quality clinical studies is limited.

OBJECTIVE. To examine long-term survival following treatment of cardiac arrest with therapeutic hypothermia.

METHODS. Admissions in the Swedish Intensive Care Registry (http://www.icuregswe.org) during 2004–2008 were examined. Patients with cardiac arrest were identified by the principal diagnosis at discharge from ICU. Age, gender, illness severity (APACHE II) and length of ICU-stay were analyzed per treatment group (with or without therapeutic hypothermia) and using Chi^2 and *t*-tests. Survival was examined with the Kaplan–Meier method. Logistic regression was used to calculate crude and adjusted odds ratios.

RESULTS. We identified 1,989 first admissions (readmissions excluded) with cardiac arrest as principal diagnosis. Patients that received therapeutic hypothermia ($n = 728$) were more likely to be male ($P < 0.001$), they were younger (64 vs. 68 years, $P < 0.001$) and had higher APACHE II scores (24 vs. 22 points, $P < 0.001$). Survival in the hypothermia group was significantly greater (Fig. 1). The odds ratio (95% CI) for 90-days survival with therapeutic hypothermia was 1.6 (1.3–1.9), and after adjustment for gender, age and APACHE II score 1.5 (1.3–1.8).



Kaplan-Meier survival curves

CONCLUSION. Therapeutic hypothermia after cardiac arrest was associated with improved long-term survival.

0696

USEFULNESS OF INTRA-AORTIC BALLOON PUMP COUNTERPULSATION IN PATIENTS WITH CARDIOGENIC SHOCK FROM ACUTE MYOCARDIAL INFARCTION: A LONG-TERM FOLLOW-UP STUDY OF 300 PATIENTS

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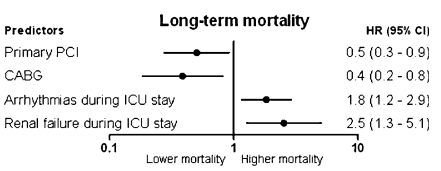
INTRODUCTION. Although intra-aortic balloon pump (IABP) counterpulsation is increasingly being used for treatment of patients with cardiogenic shock from acute myocardial infarction (AMI), data on long-term outcome is lacking.

OBJECTIVES. The aim of this study was to evaluate 30-day and long-term mortality, and their predictors, in patients with AMI complicated by cardiogenic shock who were treated with IABP counterpulsation.

METHODS. From January 1990 to June 2004, 300 consecutive patients treated with IABP were included. Median follow-up duration was 6.1 years (range 0–15 years). A Cox-proportional hazards model was used to identify predictors of long-term outcome.

RESULTS. Mean age of the study population was 61 ± 11 years and 79% of the patients were men. Survival until IABP removal after successful hemodynamic stabilization was 70% ($n = 211$). Overall cumulative 30-day survival was 58%. Thirty-day mortality decreased over time from 52% in 1990–1994 to 36% in 2000–2004 ($p < 0.05$). In patients who survived until IABP removal, cumulative 1-, 5-, and 10-year survival rates were 69, 58 and 36%, respectively. Adjusted predictors of long-term mortality were arrhythmias during ICU stay (HR 1.8, 95%CI 1.2–2.9) and renal failure during ICU stay (HR 2.5, 95% CI 1.3–5.1). After adjustment, treatment with primary percutaneous coronary intervention (HR 0.5, 95% CI 0.3–0.9) or coronary artery bypass grafting (HR 0.4, 95% CI 0.2–0.8) were associated with lower long-term mortality.



CONCLUSIONS. In patients with AMI complicated by cardiogenic shock treated with IABP, 30-day survival improved over time. An encouraging number of patients survived at the long-term. Revascularization strategies were associated with a beneficial outcome.

Caring for patients: 0697–0710

0697

IS IT NECESSARY FOR NURSES TO KNOW ABOUT THE QUALITY OF LIFE OF PATIENTS FOLLOWING INTENSIVE CARE?

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There is increasing evidence that survivors of critical illness who required intensive care suffer from impaired quality of life (Rubenfeld 2009). Research carried out in Europe, North America and Australia report that patients recovering from critical illness experience physical and psychological impairments that affect their every day quality of life (Dowdy et al. 2006). Recovery is slow ranging from six months to two years (Angus et al. 2002). The factors that have been reported to determine long-term survival include age, comorbidity, primary diagnosis and severity of illness (Williams et al. 2008).

The aim of this presentation is to critique current research that measured the quality of life of survivors of critical illness who required intensive care. Current literature suggests that the reductions in quality of life found in survivors from specific diagnostic groups of critical illness, for example Sepsis, are indistinguishable from other critically ill patients (Granja et al. 2004). Hence literature measuring the quality of life of patients from a variety of diagnostic groups will be included in this review.

The heterogeneity of critical illness and individuality of coping mechanisms make the design of research studies challenging. This presentation will examine these challenges in relation to the subjective and objective nature of quality of life, the appropriate timing and current validated tools of assessment.

It is essential for nurses to be aware of the short and long-term physical and psychological consequences associated with the combined effects of illness, the intensive care experience and the uncertain recovery period for both patients and their families. Such information could facilitate nurses to advice patients and significant others that even after leaving the intensive care unit there is still a relative risk of morbidity and mortality to be faced in the following years. Patients and families need to be prepared for a slow recovery period and the potential need for rehabilitation, follow-up, and ongoing treatment.

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0698

THE PATIENT'S PERSPECTIVE: ONE KEY TO IMPROVING ICU CARE AND TREATMENT

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INTRODUCTION. This paper arises from reflecting on my own ICU hospitalization (see Rier, 2000), in light of published accounts of the ICU patient experience.

OBJECTIVES. (1) Describe key aspects of my experience as an ICU patient; (2) highlight certain insights from the illness narratives literature; and (3) suggest how attending to the patient's perspective can improve care.

METHODS. First-hand case report; literature review; visits to and/or observation of ICUs on four continents, 2007–2009**.**

RESULTS. First: even the weakest, most dependent patients can have rich interior lives (Bauby 1997); this bears special implications for staff. Second, the essence of the patient experience is dependence (both physical and emotional) on staff (and visitors), along with a shrinkage of one's life to the few square meters around the bed. In this environment, how staff relates to and communicates with patients assumes immense significance (Baier and Schomaker ([1986]1995; Rier 2000). Communication with patients is extremely important, both for proper pain management, and for maintaining patients' emotional well-being. Even small gestures can affect a patient's mood. Staff's efforts to support patients can prevent loneliness and depression, and strengthen their will to live. Third, cultivating hope and optimism may require concealing from patients various aspects of their condition, as Simpson (1982) perceptively noted regarding her own experiences. Fourth, an often-overlooked aspect of the patient experience involves the spatial ecology of the unit. Visits to ICUs on four continents revealed a great variety of physical layouts, with a wide disparity in the proximity of nurses to patients. The effect of these differences on the patient experience has barely been examined in the academic literature. Anecdotal evidence suggests that culture and stage of illness can influence these patterns significantly. Finally, we know virtually nothing about how gender mediates the ICU patient experience.

CONCLUSIONS. ICU patients can have very active interior lives. Staff (as well as visitors) have enormous influence on patients' moods, on their will to survive, and on their quality of life while in the unit. Continued research, ideally on larger populations, and employing memory aids to prompt adequate recall of ICU experiences, is necessary. Topics such as: disclosure of information; spatial unit design and its impact on social support; and gender deserve particular attention.

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0699

LONG TERM OUTCOME AND QUALITY OF LIFE OF ICU PATIENTS MEASURED WITH THE EQ-5D QUESTIONNAIRE

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INTRODUCTION. The main goal of the ICU care is the reduction of morbidity and mortality. However, less attention is paid to quality of life (QOL) after ICU discharge. The aim of our study was to evaluate the mortality and the QOL of ICU patients at six months and one year after ICU discharge.

METHODS. Over a period of 1 year, all ICU patients hospitalized for more than 48 h were included in the study. We evaluated the patient's ICU and in-hospital mortality and the mortality and the QOL 6 months and 1 year after ICU discharge. The QOL was evaluated with a telephone interview using the EQ5D questionnaire. The EQ-5D questionnaire evaluates the mobility (MO), autonomy (AU), the usual daily activities (DA), the anxiety or depression (AD) and the presence of discomfort or pain (DP) in three levels of severity (1 = No problem, 2 = moderate disability, 3 = severe disability) and the patients overall health status in a scale from 0 to 100. Non-parametric variables were analysed using the Wilcoxon signed ranks test and parametric variables with the paired *t* test.

RESULTS. The data of 303 patients admitted in the ICU (208 M/95F) aged 58 ± 17 years were analysed. Among them 67 died in the ICU (22.1%), and 40 (13.2%) died in the hospital after ICU discharge (overall in-hospital mortality 35.3%). Of the 196 patients discharged alive from the hospital, 21 (7%) died during the first 6 months and only 4 (1.3%) afterwards. Overall year mortality 43.5% of all patients. A statistical significance was found between dead and alive patients in age (63 ± 16 vs. 55 ± 18 years) and in ICU stay (8 ± 10 vs. 11 ± 11 days) but not in the APACHE score on admission (17 ± 3 vs. 16 ± 2). Overall health status at 6 months was estimated at 65% and significantly improved at 1 year 75% ($p < 0{,}01$). A statistical significance was also found between 6 months and 1 year in QOL indices; Precisely, improvement was observed in MO from 2.5 to 2.62 ($p < 0{,}05$), in DA from 2.3 to 2.5 ($p < 0.01$), in DP from 2.5 to 2.7 ($p < 0.01$) and in AD from 2.3 to 2.5 ($p < 0{,}01$) but not in AU (2.68 vs. 2.7 p = NS). At 1 year, 67% of the patients who worked prior to the ICU admission had returned to work.

CONCLUSION. In hospital mortality of ICU patients remains very high. On the contrary mortality after hospital discharge is low. QOL 6 months seems to be satisfactory and continue to improve at 1 year.

0700

SATISFACTION WITH NURSING CARE IN RETURNING HOME OF LIVER TRANSPLANT

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INTRODUCTION. In differentiated healthcare, the promotion of health and health education activities are indispensable for personal empowerment, preparing the individual to prevent complications of his own disease, exercising a greater control over his own health, resulting in global health gains.

This investigation was intended to analyse the satisfaction of liver transplant patients about the nursing care given, concerning health education, as well as to try and identify aspects that influenced the patient's perception and experience when dealing with the preparation of returning home.

METHODS. The study was descriptive, with a mixed approach of exploratory and mixed inquiry, with qualitative and quantitative orientation, in a deductive-inductive direction. The inquiry was based on the scale "As suas Opiniões sobre os Cuidados de Enfermagem"-(1999), Portuguese version Center of Studies and Inquiry in Health (in Faria 2006), adapted and validated to the Portuguese population from the original scale of de Bond, S.; Thomas, L. et al. (1995) "The Newcastle Satisfaction With Nursing Scale"-(1988) Centre for Health Services Research, University of Newcastle Upon Tyne, UK. The population integrated a convenience sample of 75 liver transplant patients. The results were based on the methodological movement structure, level of expectations, experience and perception of the patient's satisfaction.

RESULTS. Of the 75 patients, 72% were male and 28% were female, with mean age of 45.6 years, and mean hospital stay of 26.4 days. Regarding chronic illnesses: 39% Cystic Fibrose and PAF, 20% Viral hepatitis and 20% liver cirrhosis. This study draws attention to the fact that demographic factors such as age (0.024 p) and hospitalisation time (<0.001 p) influenced expectations, as well as previous experiences influenced the manner in which these patients received information during their hospital stay. The patients submitted to liver transplant, questioned in this study, affirmed, in a global manner, that nursing care given during admission, concerning health education for returning home were "Good/Very Good" (85%) and "Reasonable" (15%).

CONCLUSION. Expectations, previous experiences, experience with and perceptions about nursing care as well as hospital discharge preparation were in this context, recognized as influences on the satisfaction of nursing care given. It is indispensable, therefore, that activities related to health education autonomously developed by nurses, contribute to emphasize the professional role of nursing care, highlighting the nurse's intervention with the patient and/or family when returning home.

0701

PROVIDING NURSING CARE TO FAMILY CAREGIVERS

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INTRODUCTION. Providing nursing care to family caregivers' constitutes one of the most demanding and important activities by nurses. In this direction, nurses assume a fundamental role, once they must to prepare the family caregiver to take care at home of the dependent person, by giving the right solution on each case.

OBJECTIVES. The aim of this part of study was to know the nature of nursing interventions when they identified family caregivers' needs, centered in returning home of the dependent person.

METHODS. Retrospective collection data of all patients admitted to the Medicine ward of ULSM-HPH from the 1st January 2008 to 31th December 2008. The data collection was accomplished appealing to the analysis of the records documented in the computer system using the ICNP®.

RESULTS. By the analysis of the nursing data, 918 ill persons were admitted at the unit. We found 411 cases (44.8%) in which the caregiver it was a target of attention, since there was a need for continuity of care at home. 4564 records were documented based on nursing interventions centered on the family caregivers'. The action type with more records are the "teaching" with 2909 (63.7%), followed by "training" with 859 (18.8%), and "instructing" with 242 (5.4%); others nursing interventions have 540 records (12.1%). So we decided to stick with only these three actions types. The Table 1 below shows the records of the action types in each Nursing Phenomenons with its dimensions ("skills learning" and "knowledge").

TABLE 1 RECORDS ON NURSING PHENOMENON ON ITS DIMENSIONS

Action type Focus	Teaching	Instruction	Training	Total of records	Valid percent
Pressure Ulcer	722 (80.7%)	42 (4.7%)	131 (14.6%)	895	19.6
Turning of own body	314 (61.9%)	46 (9.1%)	147 (29.0%)	507	11.1
Self Care: Feeding	256 (60.2%)	21 (4.9%)	148 (34.8%)	425	9.3
Self Care: Toiletting	254 (67.0%)	20 (5.3%)	105 (27.7%)	379	8.3
Self Care: Hygiene	241 (69.9%)	14 (4.1%)	90 (26.1%)	345	7.6
Self Care: Dressing	244 (73.3%)	23 (6.9%)	66 (19.8%)	333	7.3
Transfer of own body	147 (62.8%)	22 (9.4%)	65 (27.8%)	234	5.1
Falling	189 (85.1%)	7 (3.2%)	26 (11.7%)	222	4.9
Others				1224	26.8

With regard to Nursing Phenomenons in its Dimensions we found more interventions related with the caregiver in "Pressure Ulcer" with 895 (19.6%), followed by "Turning of own body" with 507 (11.1%), and "Self Care: Feeding" with 425 (9.3%). We also found in these Phenomenon Nursing Dimensions, the action type "teaching" as the most recorded, over than 60%, since the main dimension identified by nurses is focuses on knowledge not demonstrated. These kind of interventions have the focus on the potential for enhancement of family caregivers knowledge and skills learning to prevent pressure ulcers and impaired nutrition.

CONCLUSIONS. In conclusion, we can say that nurses try to provide knowledge to family caregivers', which allows them to take care of the dependent person at home. There is also concern about the caregivers training in the instrumental field.

0702

THE USE AND PRACTICE OF PATIENT DIARIES IN ICU FOLLOW-UP IN SWEDEN

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Since 1991, patient diaries have been used in ICU follow-up in Sweden. There is a paucity on relevant data evaluating the effect of this tool and also on what premises patients are enrolled. Likewise, data are sparse on the diaries' design, content structure and the use of photos. The aim was to describe and to compare the extent and application of patients' diaries in Sweden in relation to ICU levels and some form of ICU follow-up like telephone or personal contact. Data was collected by a semi-structured telephone-interview with dedicated personnel. The results were analysed with descriptive statistics and differences between the ICU levels were explored by χ^2 analysis. Qualitative manifest content analysis was done to explore the reasons and aims for diary writing. Of all ICUs (99%) responded and 75% used diaries. The source of inspiration was collegial rather than from scientific data. The main reason for diary keeping was to help the patient to recapitulate the ICU stay. Discrepancies between the different levels of ICUs were detected in patient selection, dedicated staff for follow-up and the use of photos. Comparison between the χ^2 analysis and the content analysis result displayed incongruence between the set goals and the activities for achievement but did not explain the procedural differences detected between the ICU levels.

CONCLUSION. The use of diaries in the post-ICU follow-up is common in Sweden. A majority use defined goals and content structure. However, there are differences in practice and patient recruitment among the levels of ICUs. These discrepancies are not based on evidence based data nor on ongoing research or evaluation but merely on local opinion. As ICU follow-up is resource intense and time consuming it is paramount that solid criteria for patient selection and guidelines for the structure and use of diaries in post ICU follow-up are defined.

0703

THE COPING MECHANIZMS BETWEEN CIRITCAL CARE AND OTHER ACUTE CARE NURSES IN HUNGARY

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BACKGROUND. The environment of caring for acutely ill patient is always a stressful job which requires various coping strategies from nurses. Our aim was to detect the differences in coping strategies between nurses in critical care (intensive, coronary care, emergency room) setting and in other acute care units (surgery, acute internal medicine).

METHODS. A cross-sectional study design was used to explore the coping strategies in acute care settings in a Hungarian hospital in 2008. An adopted standardized tool (Folkman–Lazarus) was applied to measure coping behaviour. Inclusion criteria were working in the given setting more then 2 years as a bed-side staff nurse and not being involved in managerial tasks. The data analysis was done with Chi-square, *T*-test and ANOVA method using SPSS 14.0. ($p < 0.05$)

RESULTS. Out of 130 self-fill in questionnaire 114 was evaluated, making a response rate of 80%. The average age was 37.8 years and 87% of the was female. Almost half of the nurses (54 persons) worked in critical care units and the rest in other acute words (60 persons). Nurses work in 12 h shifts predominantly (80%). The majority of the critical care nurses use the planful problem solving (2.86 vs. 2.81, $p = 0.048$), distancing (2.69 vs. 2.56, $p = 0.046$), positive reappraisal (2.68 vs. 2.60, $p = 0.46$), confrontive coping (1.49 vs. 1.37, $p = 0.04$). More non-critical care nurses apply escape-avoidance, than other acute nurses (2.68 vs. 2.50, $p = 0.032$). In seeking social support (2.19 vs. 2.20, $p = 0.52$), self-controlling (1.69 vs. 1.69, $p = 0.32$), accepting responsibility (1.71 vs. 1.71, $p = 0.56$) there were no significant difference between the two groups.

DISCUSSION. The acute care nurses use both, problem-centred and emotional coping in the same time. For them informational and tangible social support, efforts to regulate their emotions and actions are important. Facing problem with a concomitant theme of trying to put things right play the same role in their every day coping. Critical care nurses tend to choose solutions in a problem focused way more. They make cognitive efforts to detach themselves and to minimize the significance of stressful situation. Although some emotional aggressive events can be detected as well which requires prevention methods in order to avoid aggression to patients.

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0704

WELCOME TO TEAM LEADER SCHOOL!

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INTRODUCTION. With the changing nature of Intensive Care we are now facing challenges which require an innovative and targeted approach to achieve better outcomes for our patient and provide greater job satisfaction and support for nursing clinicians in intensive care.

Some of the challenges that have prevailed in this ICU over the last 5 years include: delayed discharge, skill mix, Elective Surgery and increase in ICU bed numbers.

Addressing the issues that currently face our day to day work looking at future work influences (opening even further beds), succession planning, maintaining and promoting a safe and supportative work environment, creating awareness of outside factors that directly impact the daily management of ICU have lead to the development of the Team Leader Programme.

Through the linking of management and leadership skills with clinical practice, The Team Leader Programme, aimed to provide the Clinical Nurse Specialist with the actions, knowledge, tools and support to enhance the units current and future practice.

METHODS. The competency-based programme was based on structured support and guidance from Nurse Unit Managers, development of individual and generic objectives, continuous progress and development review and enhancement of clinical skills. Objectives focussed on three main themes: facilitating improvement in patient flow, multidisciplinary communication and quality and standards of patient care. In addition, a monthly evaluation of key performance indicators, which would reflect the effectiveness of the programme, was conducted. These included RISKMAN incidents and elective case cancellations. Staff forums were conducted prior to introduction and at completion of programme.

RESULTS. All participants completed competencies, objectives and performance reviews facilitated by the ICU Management team. An audit was conducted reviewing RISKMAN incidents pertaining to patient care prior to the introduction of the programme and through the 6-month study period. Number of incidents relating to sub-optimal care significantly reduced. Staff forum demonstrated improvement in review and assessment process including communication and documentation. Reduction in cancellation by ICU of elective cases was shown. Elective HDU cases benefited as a result.

CONCLUSION. The Team Leader Programme equipped nurses with the management and leadership skills to proactively address and improve patient care and flow. The progress demonstrated has encouraged further development in patient care initiatives to ensure patient throughput while still maintaining elective and emergency needs.

0705

PATIENT'S CARE IN AN ADULT ICU: SHALL WE RESTORE FAMILY'S PARTICIPATION?

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OBJECTIVES. We evaluated patients', families' and staff's opinion on feasibility, satisfaction and stress concerning participation of relatives to patient's care in an adult ICU.

METHODS. In an adult ICU of a general hospital, we conducted a two-phase study. First, anonymous questionnaires were given to caregivers to identify eligible cares among a list of 26 (aiming comfort but also washing the deceased, attending medical examination or techniques or resuscitation); and to evaluate predicted satisfaction of patients, relatives and stress on the staff. Eligible cares were defined as having mean scoring more than 8 on a 10 points scale ranging from 0 = too risky/not feasible to 10 = not risky/fully feasible, not eligible cares as scoring less than 5. Second, families' and patients' opinions were anonymously collected (study still in process) on eligible cares on a 10 points scale.

RESULTS. ICU staff ($n = 49$): 100% of staff members answered the questionnaire (nursing assistants 17, nurses 24, medical staff 8). 11 cares were considered eligible, 6 cares were judged not eligible and 9 cares scored between 5 and 8 meaning intermediate opinion. Not eligible cares were mostly those involving caring of intubated patients with risk due to the proximity of the oro-tracheal (OT) tube (e.g. shaving or cleaning oral cavity). Eligible cares consisted of those involving care to non-ventilated patients or far from the OT tube (e.g. helping a patient to eat or massaging hands and feet). The project of relatives' participation to care was judged interesting (mean 7.6 ± 3.3), having moderate impact on caregivers' stress (mean 5.4 ± 3.1) and improving families' satisfaction (mean 7.6 ± 2.6).

Patients ($n = 26$, 14 males, 12 females): median [extremes] age was 67 [19–86], SAPSII : 46.5 [10–95], SOFA: 4.5 [0–14], duration of ICU stay: 5.5 [2–63] days. The project aroused high interest (7.6 ± 3), evaluated patients' and families' satisfaction were high (7.9 ± 2.3 and 7.4 ± 3.2, respectively), impact on stress moderate (4.7 ± 4.4). Most of proposed cares resulted in high satisfaction except those involving patients' intimacy (e.g. toilet, attending medical examination). Acceptance of care by a spouse was almost unanimous, but by other relatives more variable.

Families ($n = 20$): The same results (interest: 8.3 ± 3.3, evaluated patients' and families' satisfaction: 8 ± 3.3 and 8.7 ± 2.7, respectively, impact on stress: 4.7 ± 4.4) and reservations about intimate cares as patients were expressed by family members, and mixed opinion concerning attending resuscitation.

CONCLUSION. Relatives' participation to critically ill patients' care aroused high predictable satisfaction in caregivers, family members and patients. Reservations were expressed concerning intimacy and by caregivers concerning risk due to oro-tracheal intubation. Giving care to an adult critically ill patient was anticipated as moderately stressful and might be proposed to family members.

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0706

FINDING HUMANITY AMONG ALL THE TUBES, MACHINES, AND INSTRUMENTS. DEALING WITH FRIENDS AND FAMILY OF PATIENTS IN THE INTENSIVE CARE UNIT

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The purpose of this project was to develop how to deal with and support friends and family of ICU patients. Additionally, the goal was to write an evidence based functional model on this subject and to formulate a functional guide for use in the orientation programme for new employees. In studying the kinds of support needed by the friends and family of ICU patients from their point of view, emotional, informational, and concrete support were investigated.

A questionnaire targeted at the family and friends of ICU patients was developed to determine what kinds of experiences of support they had while their loved one was in the ICU. The data was collected from January through May of 2006. The target group consisted almost exclusively of family members of the ICU patient, and was given to the families of 50 patients during the research period. The questionnaire was given to the family during the second visit to the ICU and the results were analysed using the EXCEL statistics programme.

The majority of the family members and friends that participated in this study felt that during the ICU stay they were in need of support, especially from the nurses, doctors, and social workers. The staff had provided sufficient support to 88% of the respondents. These respondents felt that their need for information had been satisfied by the staff of the ICU. In their opinion, information received from the doctors as well as the nursing staff had been based in fact, had been understandable, cohesive, and pertinent. The possibility to discuss matters with the doctors was adequate for 63% of the respondents. The informational support was well provided. In conjunction with this project, a guidebook was developed for the family and friends of ICU patients that explained practical aspects of intensive care that are very important. Responses to a questionnaire done during this project indicated that 85% had indeed read the information, and that the majority of these had benefitted from the contents of the guidebook. The results of this project reveal that friends and family of patients in the ICU received adequate information from the staff of the ICU.

Respondents reported that during visits to the ICU, they had received the emotional support that was needed. All of the respondents felt that their loved one had received good care while in the ICU, and they had complete trust in the professional expertise of the ICU staff. They also felt that the staff took their wishes into consideration concerning the care of the patient (80%). According to the results, the respondents felt that the need for concrete support was less important when compared to the need for emotional and informational support.

This development project revealed valuable information about the experiences of the family and friends of ICU patients about support received from the staff. These results will be used in the future as part of the orientation programme for nurses new to the ICU.

0707

CAREGIVERS' NEEDS IDENTIFIED BY NURSES

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INTRODUCTION. Today, an increasing number of family members assume great responsibility by taking on tasks that would normally be performed by nursing staff. They represent a large and extremely important group for the care recipient and the health services. In this direction, nurses assume a fundamental role, once they must to prepare the family caregiver to take care at home of the dependent person.

OBJECTIVES. The aim of this part of study was to recognize the family caregivers' needs identified by nurses, when they have a dependant to take care at home, in order to adjust the nursing interventions to obtain the best results on the caregivers' preparation.

METHODS. Retrospective collection data of all patients admitted to the Medicine ward of ULSM-HPH from the 1st January 2008 to 31th December 2008. The data collection was accomplished appealing to the analysis of the records documented in the computer system using the ICNP®.

RESULTS. By the analysis of the nursing data, 918 ill persons were admitted at the unit. We found 411 cases (44.8%) in which the caregiver it was a target of attention, since there was a need for continuity of care at home. 3,356 records were documented based on nursing diagnoses centered on the family caregivers'. The dimensions with more records are the "knowledge" with 2,202 (65.6%), followed by "skills learning" with 752 (22.4%), and "Involving" with 268 (8.0%); others dimensions have 134 records (4%). We decided to stick only the two dimensions with the most number of records: "skills learning" and "knowledge" (2,954 records), making the analysis of the status "demonstrated and not demonstrated" in each Nursing Phenomenon. The data are shown in the Table 1 below.

TABLE 1 NUMBER OF RECORDS BY DIMENSION

Dimensions Focus	Demonstrated skills learning	Not demonstrated skills learning	Demonstrated knowledge	Not demonstrated knowledge	Total of records	Valid percent (%)
Pressure Ulcer	30 (6.7%)	59 (13.2%)	104 (23.3%)	253 (56.7%)	446	15.1
Self Care: Feeding	55 (15.4%)	71 (19.9%)	88 (24.7%)	142 (39.9%)	356	12.1
Turning of own body	31 (9.7%)	65 (20.4%)	72 (22.6%)	150 (47.2%)	318	10.8
Self Care: Toiletting	31 (11.0%)	51 (18.1%)	66 (23.5%)	133 (47.3%)	281	9.5
Self Care: Hygiene	19 (7.6%)	49 (19.7%)	57 (22.9%)	124 (49.8%)	249	8.4
Self Care: Dressing	30 (12.0%)	49 (19.7%)	54 (21.7%)	116 (46.6%)	249	8.4
Self Control: Infection	23 (10.3%)	31 (13.9%)	52 (23.3%)	117 (52.5%)	223	7.5
Transfer of own body	13 (6.1%)	43 (20.2%)	42 (19.7%)	115 (54.0%)	213	7.2
Others	36 (5.8%)	66 (10.7%)	155 (25.0%)	362 (58.5%)	619	21.0

With regard to Nursing Phenomenon with more diagnoses related with the caregiver, the Nursing Phenomenon with more records is the "Pressure Ulcer" with 446 (15.1%), followed by "Self Care: Feeding" with 356 (12.1%) and the "Turning of own body" with 318 (10.8%), focus on the potential for enhancement of family caregivers knowledge and skills learning to prevent pressure ulcers and impaired nutrition.

CONCLUSIONS. We can say that in all Nursing Phenomenon identified, the dimension "knowledge not demonstrated" is the one with more records, showing the concern of nurses for this area. It appears, with the exception of the "Transfer of own body", the rate of resolution of the situation is over than 40%, which shows concern of nurses for the returning home of the dependent person.

0708

EVALUATION OF CRITICAL CARE NURSES' WORK ENVIRONMENT AND JOB SATISFACTION IN GREECE

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AIMS. There is a significant body of evidence that adequate nursing care has a great impact in the quality of inpatient care. However, an increasing intention to leave ICU is recorded among critical care nurses. The purpose of the study was to evaluate the status of critical care work environment, as well as the job satisfaction, as perceived by critical care nurses in Greek ICUs and to identify the sources of dissatisfaction.

METHODS. Cross-sectional survey conducted in the ICUs of nine national and two private hospitals in Greece. A 40-item Questionnaire, primarily based on NWI-R, was distributed over a period of 1.5 year to critical care nurses. Demographics, organizational environment, satisfaction and intention to leave were collected on a Self-report basis. Perception of each item was indicated by answering strongly disagree (1) to strongly agree (4) on a Likert scale. All surveys were anonymous

RESULTS. A sample of 245 nurses (79.2% women and 20.8% men) was obtained. Response rate was 62%. Their mean age was 35 ± 6.8 years, experience in health care 10.4 ± 6.8 years, time in ICU 7.2 ± 5.4 years while time in current position 6.1 ± 5 years.

The majority of responders perceive communication, collaboration and team working with physicians as good or quite good (81.4, 80.2 and 84.1%, respectively) while they recognize value physicians bring to the work of the organization. Furthermore, they agree that nurse manager is a good leader and supportive of them, while they rate communication with administration as poor or fair. Nearly half of them believe that their work schedule is not flexible.

A substantial number of nurses have a negative or quite negative perception regarding staffing, auxiliary staff, nurse/patient ratio and available time per patient (84, 65.8, 87.3, and 68.3%). The majority of them view negatively their salary, career development opportunities, acknowledgement of their contribution and use of their diagnoses.

Intention to leave ICU was expressed by 31.8% of participants. Their plan to leave was independently associated with organizational climate factors, while the role of nurse manager seemed to have a positive impact on their desire to remain in ICU.

CONCLUSIONS. Our findings are consistent with other studies, indicating that nurses' problems are common worldwide. It is important to know the factors that are associated with nurses' dissatisfaction about work environment in ICU, since high quality nursing care can affect significantly patient outcome.

0709

NURSING ACTION IN THE CONFUSED PATIENT

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INTRODUCTION. The exponential growth of elderly population present new challenges to the health care providers' systems: the modification of the paradigm of care and the development of content for *Nursing Information Systems*, that support the nurses' clinical decision.

OBJECTIVE. The 'confusion', a phenomenon associated with age, has ethical and safety implications to the patient, and high social, political and economical costs. After improvements in diagnosis and treatment, there is no evidence that support changes in practice, as it is being managed with individual criteria. As so, we want to understand its clinical utility.

MATERIAL AND METHODS.

(a) Study of action research in an acute medical unit, where we applied the NEECHAM scale;
(b) Interviews to nurses and participant observation. We used the method of Strauss and Corbin to generate a Grounded Theory, using the informatics program *NVivo7*.

OUTCOMES. The model created, suggests the importance of simultaneously considering two areas: the *Functional Status* (FS) and *Behavioral Responses* (BR). From this conceptual model emerged different types of confused patients.

DISCUSSION. The importance of the outcomes to the clinical practice is significant. The next step will be the application of the algorithm in the computer application SAPE (Support System of Nursing Practice), using the ICNP. When used together, FS + BR, emerged patients with common characteristics. It is possible to allocate ab initio a series of interventions, helping nurses to decide, and promoting nursing sensitive outcomes.

0710

ESTIMATION OF AN ICU PATIENT'S HEIGHT AND WEIGHT BY HEALTHCARE PROFESSIONALS

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OBJECTIVES. In a patient newly admitted to the intensive care unit, usually the height and weight are not precisely known. However, to facilitate comparison between patients, these values are required for indexing physiologic values like Cardiac Output (CO), Global Enddiastolic Volume (GEDV) or Extravascular Lung Water (EVLW) derived from transpulmonary thermodilution. To investigate the error of estimating height and weight, we analysed prospective data from a previous trial on the age dependence of GEDV [1].

METHODS. Patients scheduled for elective brain tumor surgery were measured and weighted at study inclusion. On the following day, postoperatively the patients were routinely admitted to the Neurosurgical Intensive Care Unit. A member of the ICU team was asked to estimate the patient's height and weight. For analysis, both values were compared to the preoperatively measured ones using the approach according to Bland and Altman [2].

RESULTS. Data was available from 109 pairs of estimated and measured values. Patient's measured height ranged from 149 to 194 cm, measured weight ranged from 47 to 125 kg. On average, bias in height estimation was 0.9 cm, with a 95% precision range of −13.4–15.2 cm. Mean weight estimation bias was −2.9 kg, with a 95% precision range of −21.8 kg to 15.9 kg. This resulted in a mean bias for body surface area of −0.7%, the 95% precision ranging from −12.1 to 13.5%. The sex of the patient or the profession of the estimating ICU team member (nurse/physician) did not influence these results.

CONCLUSIONS. Estimation of height and especially weight of a patient is weakly performed by healthcare professionals. This has impact on the accuracy of indexed values of transpulmonary thermodilution (and other size- or weight-related measurement and treatment in the ICU).

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0711

AGE AND MECHANICAL VENTILATION: AN ICU SURVEY

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INTRODUCTION. The ederly population is growing in Spain, Europe and USA. Many investigators have reported rising number of elderly patients in the intensive care units.

OBJECTIVE. To analyze outcome and factors that may influence mortality in critically ill elderly patients with mechanical ventilation.

METHODOLOGY. We made a retrospective review of the ICU database betweeen June 2006 to July 2008. We used 75 years as aged cutt-off point and Charlson index for comorbidity assessment. The Mann–Whitney test and *T*-student test were used to analyse continuous variables with a non-normal and normal distribution in two groups of patients. Categorical variables were compared using chi-square analysis. Multivariate logistic regression analysis was applied to determine the independent contribution of clinical variables to the prediction of mortality as a dependent variable. Statistical analyses were performed using SPSS 12.0.

RESULTS. We registered 955 patients in the study period. 168 (18%) were ventilated patients. We excluded 23 with ICU stay less than 24 h.

In the multivariate analyses hospital mortality increased with age >75; APACHE III, APACHE III without age influence (Tables 1, 2, 3)

TABLE 1 UNIVARIATE ANALYSIS

	<75 years	>75 years	*P*
N	97	46	
Age (median)	57	80	
APACHE III (median)	69.9	84	0.006
APACHE III without age inlfluence (median)	61.5	65.9	0.38
ICU stay	7.35	6	0.46
Charlson index	1.29	1.55	0.33
ICU mortality	27 (28%)	28 (60%)	<0.001
Hospital mortality	33 (34%)	31 (67%)	<0.001
Mortality by APACHE III	0.31	0.50	

TABLE 1 MULTIVARIATE ANALYSIS

	p	OR	95% CI
Age>75 years	0.04	4.83	1.54–10.76
APACHE III	<0.001	1.039	1.016–1.061
APACHE III (without age)	<0.001	1.036	1.015–1.058
Charlson index	0.49	1.128	0.79–1.6
Diagnosis	0.94	0.99	0.78–1.24

TABLE 1 DIAGNOSIS

	<75 years	>75 years
Surgical	24 (25%)	12 (26%)
Coronary ans cardiac insufficiency	9 (9.3%)	6 (3%)
Neurologic	11 (11%)	2 (4.3%)
Sepsis (non surgical)	7 (7.2%)	3 (6.2%)
Respiratory failure	20 (20.8%)	8 (17.3%)
Cardiac arrest	14 (14.5%)	11 (23%)
Others	4 (4.1%)	2 (4.3%)

CONCLUSION.

1. ICU and hospital mortality in ventilated patients >75 years is higher than young patients.
2. ICU mortality in ventilated patients >75 years is higher than predict mortality by APACHE III.
3. ICU stay is shorter in elderly patients.
4. In our population of ventilated elderly patients ICU mortality is not higher than bibliography.
5. Elderly patients have not higher comorbidity weigh with Charlson index.
6. ICU and hospital mortality were increased with age >75 years and APACHE III in the multivariate analyses.

0712

EVOLUTION OF ACUTE LUNG INJURY/ACUTE RESPIRATORY DISTRESS SYNDROME MORTALITY IN AN INTENSIVE CARE UNIT IN SOUTHERN BRAZIL

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INTRODUCTION. ALI (including its most severe form, ARDS) mortality rates are high despite advances in the management of patients with this condition. The knowledge about the evolution of ALI/ARDS mortality could contribute to characterize the dynamic profile of these patients and to improve therapeutic strategies.

OBJECTIVES. Our objectives were to compare the ALI/ARDS mortality rates and the ALI mortality risk factors between two cohort studies of the same ICU in different periods of time: 1999/2000 (2000 cohort) and 2004/2007(2007 cohort).

METHODS. Prospective cohort that included 1115 patients admitted to the ICU of a tertiary teaching hospital (Hospital de Clínicas de Porto Alegre) between April/2004 and April/2007 who needed Mechanical Ventilation (MV) for at least 24 h. These results were compared with a previous cohort of 1,301 patients admitted in the same ICU between April/1999 and April/2000. In both studies all patients were evaluated regarding the presence/development of ALI/ARDS according to the 1994 American-European Consensus Conference. Data were compared between the two cohorts using Student's-*t* or Chi square tests. Multivariate analysis by conditional logistic regression was used to identify ALI mortality risk factors.

RESULTS. In ALI patients ($n = 50$/2000 cohort; $n = 347$/2007 cohort) we observed: (a) an increase in both hospital (from 48 to 67%, $p = 0.02$) and ICU mortality (from 44 to 63%, $p = 0.01$); (b) a higher mean (±SD) APACHE II score (from 17.7 ± 6.5 to 23.7 ± 8.2, $p < 0.001$), and (c) an increased percentage of patients with three or more organ failures (from 30 to 42%, $p < 0.001$). Regarding ARDS patients ($n = 30$/2000 cohort; $n = 307$/2007 cohort), there were an increase in hospital mortality (from 47 to 68%, $p = 0.03$), in the mean (±SD) APACHE II score (from 17.6 ± 6.9 to 23.6 ± 8.3, $p < 0.001$) and in medical patients (from 46 to 73%, $p = 0.01$). The factors independently associated with increased hospital mortality in ALI patients were renal ($p = 0.002$) and hematological ($p = 0.02$) failures in the 2000 cohort. In the 2007 cohort, renal ($p = 0.01$) and hematological ($p = 0.02$) failures, use of vasoactive drugs ($p < 0.001$) and ICU length of stay ($p < 0.001$) were independently associated with mortality.

CONCLUSIONS. We observed an increase in the mortality rates of patients with ALI/ARDS, which according to the APACHE II score and the percentage of three or more organ failures, are more severely ill. Renal and hematological failures remained independently associated with mortality in these patients. The results suggest that ALI/ARDS patients in our ICU have more severe illness, what could explain the increase in the mortality rates highlighting the relevance of a better understanding of such findings.

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0713

INFLUENCE OF THE DURATION OF INVASIVE MECHANICAL VENTILATION ON OUTCOME

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INTRODUCTION. The outcome of critically ill patients receiving mechanical ventilation has often been studied in specific groups of patients. The objective of our study was to assess the influence of the duration of mechanical ventilation on hospital mortality in a mixed population of critically ill patients.

METHOD. Review of all consecutive adult patients who received mechanical ventilation in a mixed medical-surgical intensive care unit during a 22-month period.

RESULTS. Of the 1148 patients admitted, 351 were mechanically ventilated patients (30.6%). They had a median age of 60 years and a hospital mortality of 45%. The duration of mechanical ventilation was longer in patients who died than in patients who survived (6 days [2–10] vs. 3 days [0.75–8]), but this was not an independent predictor of hospital mortality. Factors independently associated with hospital mortality were age (OR 1.05, 95% CI 1.03–1.07), cancer (OR 6.56, 95% CI 2.21–19.51), chronic respiratory disease other than asthma and chronic obstructive lung disease (OR 5.75, 95% CI 2.02–16.27), cardiac arrest during hospital stay (OR 3.89, 95% CI 1.38–10.94), coma due to other causes than intoxication (OR 10.16, 95% CI 4.1–25.19), thrombocytopenia (OR 3.5, 95% CI 1.3–9.39), need for adrenergic support (OR 4.3, 95% CI 2.23–8.29) and lowest PaO_2/FiO_2 ratio (OR 2.36, 95% CI 1.46–3.79).

CONCLUSION. Survival in mechanically ventilated patients is determined by the underlying medical condition leading to mechanical ventilation, some co-morbidities and the complications that may occur during mechanical ventilation. The duration of mechanical ventilation per se does not independently predict hospital mortality.

0714

LOW LEVELS OF CIRCULATING LEUKOCYTE AND PLATELET MICROPARTICLES ARE ASSOCIATED WITH POOR OUTCOME IN ACUTE RESPIRATORY DISTRESS SYNDROME

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INTRODUCTION. Microparticles (MPs), are effectors in vascular pathology. Lesions of lung vessels are involved in ARDS.

OBJECTIVES. We tested the hypothesis that MPs are increased in patients with ARDS and that specific subpopulations of MPs are associated with outcome.

METHODS. Fifty-two patients were enrolled in the study within the first 24 h of ARDS. Bronchoalveolar lavage (BAL) and blood samples were performed on day 1 and day 3. A control group (spontaneously breathing subjects) included 13 patients for BAL analysis. Leukocyte-derived [$CD45^+$], polymorphonuclear neutrophil [$CD11b^+/CD66b^+$], endothelial [$CD31^+/CD41^-$] and platelet [$CD41^+$] MPs were measured in arterial blood and in BAL samples using flow cytometry. Survival was registered at day 28.

RESULTS. At day 1, levels of leukocyte-derived [$CD45^+$] and neutrophil-derived [$CD11b^+/CD66b^+$] MPs were increased in the BAL fluid from ARDS patients as compared with controls ($p < 0.02$ each). At day 1, survivors ($n = 31$) had higher MPs counts in plasma from platelet origin [$CD41^+$] ($p = 0.02$) and leukocyte origin [$CD45^+$] ($p = 0.05$) than nonsurvivors ($n = 21$). In logistic regression analysis, a low level of circulating $CD45^+$ (<60 elements/microliter) was associated with a higher mortality rate (odds ratio, 4.6; 95% confidence interval, 1.08–19.49; $p = 0.03$).

CONCLUSIONS. Release of MPs is a common process in the acute phase of ARDS. Low levels of systemic leukocyte-derived [$CD45^+$] MPs are associated with worse prognosis.

0715

PROGNOSTIC IMPACT OF CT-PRO-ENDOTHELIN-1 IN CRITICALLY ILL PATIENTS WITH AND WITHOUT ACUTE RESPIRATORY FAILURE

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INTRODUCTION. Endothelin is a neurohormone that is elevated in various pulmonary diseases as well as in certain non-pulmonary causes, e.g. in endotoxemia and heart failure. The prognostic impact of endothelin in critically ill patients is essentially unknown. CT-pro-endothelin-1 (CT-pro-ET-1) is a stable precursor molecule of endothelin.

OBJECTIVES. We aimed to assess the prognostic impact of CT-pro-ET-1 in patients presenting with acute respiratory failure. Moreover, we aimed to compare the prognostic impact of CT-pro-ET-1 in patients with and without acute respiratory failure.

METHODS. In a 17 months study period, we included 344 critically ill patients in this prospective observational study. A total of 78 patients presented with acute respiratory failure on ICU admission, 266 patients had various other diagnoses excluding acute respiratory failure on ICU admission. Blood samples for determination of CT-pro-ET-1 were obtained in all patients on ICU admission. CT-pro-ET-1 was determined by use of a recently developed sandwich immunoassay.

RESULTS. A total of 66 patients had acute respiratory failure attributed to a primary pulmonary cause (COPD $n = 15$, pulmonary hypertension $n = 7$, pneumonia $n = 17$, ARDS $n = 3$, pulmonary embolism $n = 6$, postoperative respiratory failure $n = 12$ and various/mixed other causes $n = 6$), 12 patients presented with acute cardiogenic edema. On ICU admission, patients with acute pulmonary respiratory failure had significantly higher CT-pro-ET-1 levels compared to patients with cardiogenic edema and patients without acute respiratory failure (193 ± 117 vs. 160 ± 67 vs. 148 ± 94 pmol/l, $p = 0.007$, respectively). In patients with pulmonary respiratory failure and cardiogenic edema, however, there was no statistically significant difference in CT-pro-ET-1 levels between ICU survivors and ICU nonsurvivors (195 ± 155 vs. 191 ± 127 pmol/l, $p = 0.908$ and 160 ± 75 vs. 164 ± 5 pmol/l, $p = 0.940$, respectively). In contrast, in the mixed cohort of critically ill patients without acute respiratory failure on ICU admission, CT-pro-ET-1 levels were significantly higher in patients who died in the ICU compared to ICU survivors (179 ± 95 vs. 140 ± 93 pmol/l, $p = 0.007$).

CONCLUSIONS. CT-pro-ET-1 plasma levels are elevated in patients with acute respiratory failure. However, in the subgroups of patients with pulmonary failure and in patients with cardiogenic edema, elevation of CT-pro-ET-1 did not provide statistically significant prognostic information with regard to ICU survival. In contrast, in the mixed cohort of critically ill patients without respiratory failure on ICU admission, elevation of CT-pro-ET-1 was a potent predictor of ICU death.

0716

THE EFFECT OF PLASMA HOMOCYSTEINE LEVELS ON CLINICAL OUTCOMES OF PATIENTS WITH ALI/ARDS

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INTRODUCTION. Several reports have shown that homocysteine promotes thrombosis by disturbing the procoagulant-anticoagulant balance, while alterations in coagulation and fibrinolysis have been suggested as important pathogenetic and prognostic determinants of mortality in ALI/ARDS. The aim of the study was to evaluate the effect of plasma homocysteine levels on the outcomes of critically ill patients with ALI/ARDS.

METHODS. Sixty-nine consecutive ventilated patients with ALI/ARDS were studied. Blood samples were drawn within 3 days of clinical recognition of ARDS**.** Measurement of plasma homocysteine, vitamin B12, folate, creatinine, protein C and plasminogen-activator inhibitor-1 (PAI-1) antigen levels, and genotyping of the methylenetetrahydrofolate reductase (MTHFR) gene C677T and A1298C polymorphisms were carried out. The primary outcomes were 28- and 90-day mortality, while secondary outcomes included non-pulmonary organ-failure-free days, liberation from mechanical ventilation up to day 28 and ventilator-free days over the 28 days after enrollment.

RESULTS. In the multivariable analysis, plasma homocysteine concentration adjusted for age, APACHE II score, MTHFR C677T and A1298C polymorphisms, and levels of PAI-1 antigen, protein C, creatinine, vitamin B12 and folate was found to affect significantly mortality at 28 and 90 days ($p = 0.39$ and $p = 0.83$, respectively), the number of days without organ failure besides lungs ($p = 0.38$), the probability of being free from mechanical ventilation at day 28 ($p = 0.63$) and the number of days without ventilation assistance ($p = 0.73$).

CONCLUSION. Our data suggest that increased plasma homocysteine levels, either alone or in synergy with other thrombophilia risk factors like protein C and PAI-1 levels, do not seem to adversely affect the prognosis in ALI/ARDS patients.

0717

MULTIVARIATE ANALYSIS OF MORTALITY IN A STUDY WITH PATIENTS WITH ACUTE RESPIRATORY DISTRESS SYNDROME

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INTRODUCTION. Although the Acute Respiratory Distress Syndrome Network (ARDS Network) study [1] demonstrated that ventilation with low tidal volume improves mortality, it is still very high. There have been described several risk factors associated with an increased mortality in this patients [2−4]. We decided to re-evaluate these risk factors when the patients are under protective ventilation.

OBJECTIVES. To analyse the risk factors of mortality at 28 days in a study in patients with ARDS using a Cox regression model.

METHODS. We analysed the risk factors or mortality at 28 days in a cohort of patients who met the ARDS criteria of the Consensus Conference [5] after 24 h in mechanical ventilation with low tidal volume (6–8 ml/kg weight), and who were part of study comparing two methods of setting the level of positive end-expiratory pressure (PEEP): according the ARDSNetwork standard-of-care recommendations [1] or above the lower inflection point of the pressure-volume curve of the respiratory system according the method proposed by Suter [6]. Variables with normal distribution were described as mean + SD, with non-normal distribution as medians and interquartile ranges.

RESULTS. We included 70 patients in our study. Baseline characteristics of patients were mean 54.86 + 2.11 years of age, 70% male, APACHE II 19.64 + 0.85, Multiple Organ Dysfunction Score (MODS) 8.43 + 0.38, Sepsis-Related Organ Failure Assessment (SOFA) 9.11+0.45, Acute Lung Injury Score (LIS) 3 (2.5–3.25) and PaO_2/FiO_2 139.55+4.31 mmHg. The global mortality at 28 day was 30% and hospital mortality was 42.82%. The selection of variables initially included in the model were age >75 years, female sex, SOFA >9, MODS >8, worse LIS >3.25, plateau pressure >30 cmH_2O, pH at inclusion <7.34, PEEP level >10 cmH_2O, multiorgan failure free-days at day 28 >17.5 days, respiratory failure free-days at day 28 >13 days, cardiovascular failure free-days at day 28 >19 days, baseline PaO_2/FiO_2 < 100 mmHg, APACHE II >19, PEEP set according ARDS Network study. The multivariate analysis of mortality at day 28 showed that the variables associated independently with an increase in mortality were the following: female sex, setting PEEP as in the ARDSNetwork study, SOFA > 9, APACHE II > 19 and pH < 7.34 at baseline.

CONCLUSIONS. The mortality of the ARDS still continues very high, and it is related to the female sex, presence of acidosis and severity of the underlying cause of ARDS. As in previous studies the degree of hypoxemia is not correlated with the mortality.

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0718

SYSTEMATIC EVALUATION OF OUTCOMES FOR PATIENTS REQUIRING PROLONGED MECHANICAL VENTILATION

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INTRODUCTION. Recent trends indicate the number of patients requiring prolonged mechanical ventilation (PMV) (≥21 days) and protracted weaning (≥7 days) is rising. Comprehensive data on anticipated outcomes are important to guide clinician, patient, and family decision-making.

OBJECTIVE. To synthesize studies reporting characteristics and outcomes (weaning success, ventilator dependence, hospital mortality, discharge dispositions, and 1-year survival) for patients requiring PMV.

METHODS. We included studies reporting a cohort mean (or median) of ≥21 days ventilation in intensive care units (ICU), or studies describing patients admitted to a respiratory unit, weaning facility or long-term acute care hospital (LTAC) for PMV. Medline, EMBASE and CINAHL databases (1990–2008) were searched using the terms: PMV; long term mechanical ventilation; ventilation; weaning; prolonged; length of stay; and ICU, individually and in combination. Reference lists of identified papers also were examined. Two reviewers independently determined paper eligibility based on predefined criteria. Database searching yielded 324 citations of which 40 reports describing 12,866 patients were selected for independent data abstraction.

RESULTS. Eighteen (45%) prospective cohorts, 20 (50%) retrospective cohorts and 2 (5%) retrospective case control studies were identified. Of the 40 studies, 26 (65%) described cohorts admitted to specialized weaning units, 10 (25%) described patients receiving PMV in ICU, 1 (2.5%) described patients admitted to a LTAC without a weaning unit, and 1 (2.5%) described a weaning program, as opposed to physical location. Two (5%) case control studies reported patients transferred to a LTAC or weaning unit compared to historical controls in ICU or hospital wards, respectively. Patients ranged in age from 44 to 74 years; the proportion of females from 27 to 58%. Mean duration of ventilation prior to non-ICU admission ranged from 14 to 58 days; mean duration of ventilation following admission ranged from 6 to 50 days. Total mean ventilation duration for ICU cohorts was 26–60 days. Weaning success for patients discharged alive ranged from 26 to 81% (non-ICUs mean 53%, 95% confidence interval [CI] 35–71%; ICUs 57%, 95% CI 26–88%). The proportion of patients remaining ventilator dependent ranged from 3 to 68% in non-ICUs (mean 23%, 95% CI 8–38%) and 0–29% in ICUs (mean 7%, 95% CI 0–23%). Mortality ranged from 5 to 50% (mean 25%, 95% CI 10–41%) in non-ICUs and 14–49% in ICUs (mean 37%, 95% CI 7–67%). 1-year survival (reported 16/40 [40%] studies) was 23–69%; ICU-studies (4/16, 25%) was 39–46%. The proportion of patients discharged home ranged from 1 to 80% (mean 31%, 95% CI 14–49%).

CONCLUSIONS. Due to considerable variability in published reports the contribution to outcomes of patient characteristics, weaning interventions, health system organization and practice change over time remains unclear.

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0719

OUTCOME PREDICTORS OF HIGH FREQUENCY OSCILLATORY VENTILATION IN ADULT ARDS

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INTRODUCTION. High Frequency Oscillatory Ventilation (HFOV) is a promising rescue ventilatory modality in severe ARDS. Other modalities available for these patients are NO Inhalation, ECMO or Prone Ventilation. Various outcome predictors of HFOV in severe ARDS studied so far are APACHE II score, duration of conventional ventilation before HFOV, pulmonary or extra pulmonary ARDS and improvement in oxygenation after HFOV. The purpose of this study was to predict response to HFOV either before or after its initiation, so that likely non responders could be switched to alternative rescue therapies early, to get their benefit. Hence we retrospectively analysed the outcome predictors of HFOV in adult ARDS patients.

METHODS. *Setting* 40 bedded multidisciplinary ICU of a Tertiary Care Hospital in Pune India. *HFOV ventilation* ARDS patients receiving Volume Controlled Ventilation (VCV) as per the ARDSnet protocol with $PO_2/FiO_2 \leq 150$ in spite of PEEP $\geq$ 12 cm and $FiO_2 \geq 0.7$, were considered for HFOV as rescue therapy. All patients were followed up till discharge from the hospital (Survivors) or death (Nonsurvivors).

RESULTS. Data of 39 patients were analysed. There were 12 survivors and 27 nonsurvivors. Mortality rate of 69.24% was attributable to "Rescue use" of HFOV and 32 patients having multiorgan failure before HFOV. Tables 1 and 2 show parameters evaluated as outcome predictors. Binary Logistic Regression model was used to predict survival as successful response to HFOV.
Statistical Analysis 95% Confidence Interval for Odds ratio. *P* value >0.05- No significant relationship of outcome predictors with the log of odds. **P* value for the coefficient of "25%reduction in OI at 24 h" is 0.026< 0.05, shows that there is significant relationship of 25%reduction in OI with survival. Odds ratio is a ratio of probability of survival to probability of death.

TABLE 1 PRE HFOV VARIABLES

Outcome Predictor used in the model	Odds ratio	"*p*" value
APACHE II score	0.93	0.27
Presence of Multiorgan Failure	1.00	1.00
Pulmonary OR Extrpulmonary ARDS	1.21	0.78
VCV hours	1.01	0.31
PEEP	0.87	0.25
Plateau Pressure VCV	0.97	0.68
pH VCV	0.70	0.64
PCO_2 VCV	0.99	0.46
O·I. VCV	1.01	0.62

TABLE 2 POST HFOV VARIABLES

Outcome predictor used in the model	Odds ratio	"*p*" value
pH 24 h HFOV	0.82	0.25
PCO_2 24 h HFOV	1.01	0.77
25% reduction in O·I. at 24 h*	11.85*	0.02*
Hemodynamic instability after HFOV	1.70	0.43
HFOV Duration hours	0.99	0.44

CONCLUSION. Reduction of Oxygenation Index by at least 25% within 24 h after initiation of HFOV emerged as a single, statistically significant outcome predictor which could predict successful response to HFOV in Adult ARDS. Patients in whom this is not achieved may be switched to alternative rescue therapies.

0720

NONINVASIVE MECHANICAL VENTILATION (NIV) IN CLINICAL PRACTICE: A ONE YEAR EXPERIENCE IN A TERTIARY HOSPITAL

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INTRODUCTION. NIV has emerged as an important tool in the treatment of acute respiratory failure (ARF).It can reduce substantially the need for endotraqueal intubation and mechanical ventilation (MV) in a number of clinical conditions. It can also reduce the incidence of complications associated with MV, the hospital length of stay and mortality.

AIMS. To report our experience with NIV via face mask in a tertiary hospital after an educational programme for physicians and nurses and a supervised implementation of a protocol. To evaluate the feasibility and outcome results of NIV in daily clinical practice.

METHODS. A prospective cohort study, over 24 months. 81 patients with heterogeneous forms of acute respiratory failure (ARF) were included. The patient population was divided into 2 groups: hypoxemic respiratory failure and hypercapnic respiratory failure. All patients received pressure support ventilation (PSV). Medical records were analysed for physiological and outcome variables for all patients who received NIV for respiratory failure.

RESULTS. 81 patients were included (61.7% male), with a mean age of 68.7 years. Chronic obstructive pulmonary disease (38.3%) was the most frequent condition that motivated NIV followed by pneumonia (29.7%) and acute pulmonary edema (29.6%). NIV failure in the total population was 20.86% (pneumonia 64.91% and post-extubation/weaning 30%). Complications were registered in 32.1% of the patients, discomfort being the most frequent (53.6%). The hospital length of stay was 15.6 days. We did not find any independent predictive factor with statistical significance between the responders and the non-responders. The overall mortality was 21% and with no statistical significance between groups. Survival estimated by Kaplan-Meier curves showed a lower survival in the hypoxemic group (log-rank test: $p = 0.03$).

CONCLUSIONS. This study demonstrates our experience in the implementation of a NIV clinical protocol. The results suggest that NIV could be considered as a first line ventilatory treatment of acute respiratory failure of different etiologies, as a promising weaning technique and for post-extubation ventilatory support. However, NIV should be performed by a motivated and sufficiently trained care team in order to obtain the best results.

0721

OUTCOMES OF ALI/ARDS IN VITORIA, BRAZIL

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INTRODUCTION. Recent studies indicated a mortality of ALI/ARDS around 30–40%.

OBJECTIVES. to evaluate the outcomes of ALI/ARDS requiring invasive mechanical ventilation in Vitoria, city in the southeast of Brazil.

METHODS. A 15-month prospective observational study (October 2006 to December 2007) was carried out in 14 adults ICU, total of 175 ICU beds. Data was collected daily for 7 consecutive days and on the 14th and the 28th day after diagnosis of ALI/ARDS according to the AECC criteria, in patients aged 18–75 years, who required invasive ventilation for more than 24 h. Period of follow-up was 28 days.

RESULTS. From the 7.133 admissions, 130 patients fullfilled ALI/ARDS criteria (1.82%). ALI represented 37.6% and ARDS 62.4% of the patients. Males (62.3%), mean age of 44.24 ± 15.95 years. Mean length of ICU stay was 26.48 ± 18.74 days; duration of mechanical ventilation was 21.41 ± 15.41 days. APACHE II for ARDS/ALI (21.31/19.69) and LIS (2.39/1.86). The mean FIO_2 was 0.68 ± 0.20. Mean tidal volume was 9.36 ± 2.49 mL/kg PBW and mean PEEP levels 9.4 ± 3.6 cmH_2O. Mean plateau pressure was 26.14 ± 7.84 cmH_2O (92% in pressure control ventilation). Overall mortality at 28 days was 31.9% for ALI and 43.2% for ARDS.

CONCLUSIONS. In Vitória, Brazil, the 28-day mortality for ARDS was 43.2% and for ALI 31.9%.

0722

MORTALITY AT 28 DAY IN PATIENTS WITH ACUTE RESPIRATORY DISTRESS SYNDROME IN TWO STRATEGIES OF SETTING POSITIVE END-EXPIRATORY PRESSURE

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INTRODUCTION. In patients with Acute Respiratory Distress Syndrome (ARDS) in mechanical ventilation the application of *positive end-expiratory pressure* (PEEP) improves oxygenation, but also has deleterious effects [1, 2]. There are several methods to determine the level of PEEP to employ, although none of them have demonstrated to be the best. Exist few randomized controlled trial studies [3–8] that compare these methods; more of them compares a fixed level of PEEP according de fraction of inspired oxygen (FiO_2) applied to the patient, and a PEEP level set according the *lower inflection point* of the pressure-volume curve (P–V curve) of the respiratory system. Objectives: To compare the effect on mortality at 28 days of two strategies of set PEEP in patients with ARDS ventilated with low tidal volumes.

METHODS. We included consecutive patients who met the ARDS criteria of the Consensus Conference [9], after 24 h under mechanical ventilation with low tidal volume (6–8 ml/kg weight) and limitation of pressures on airway at 35 cmH_2O. They were randomized into two groups: a group control, where PEEP was set according the FiO_2 applied as in the ARDS Network study [10], or a interventional group, where PEEP was set according the method proposed for Suter [1], which consist in setting PEEP level above the lower inflection point of the P–V curve. In both groups PEEP level was set daily [11].

RESULTS. We included 70 patients, 36 in control group and 34 in interventional group. The global mortality at day 28 was 30% and hospital mortality was 42.85%. The main cause of mortality was the multiorgan failure (70%), followed by refractary hypoxemia (10%). In the control group, mortality at day 28 was 38.9 versus 20.6% on interventional group ($p = 0.12$); this trend was kept when we analyzed the mortality depending on the origin of the SDRA (Pulmonary ARDS: mortality at day 28 were 37.5% in the control group vs. 13.33% in the interventional group, $p = 0.15$. Extrapulmonary ARDS: 41.66% in control group vs. 26.31%, $p = 0.44$). When we analyzed the survival by means of the curve of Kaplan–Meier, we found that the interventional group had a better survival at 28 days, although it did not reached statistical significance.

CONCLUSIONS. In this pilot study, a mechanical ventilation on patients with ARDS based on low tidal volume and a level of PEEP set above the lower inflection point of the P–V curve of the respiratory system is associated with a strong tendency to a lower mortality at day 28.

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0723

NON-EXACERBATED COPD: DOES IT IMPACT ON MORTALITY IN INTUBATED PATIENTS ADMITTED TO ICU?

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INTRODUCTION. COPD is a major cause of chronic morbidity and mortality throughout the world. However the real contribution of COPD comorbidity in intubated patients mortality is unknown.

OBJECTIVE. The aim of the study was evaluate the impact of non-exacerbated COPD in mortality of patients under mechanical ventilation, admitted to ICU for any disease.

METHODS. An observational cohort study was performed in a multidisciplinary ICU. All the patients under mechanical ventilation for more than 48 h, in which the lower tract infection was ruled out at admission were included. Patients were divided in two groups depending on the presence of COPD (COPD, NON-COPD). Demographic variables, comorbidities, illness severity at admission, ICU complications and ICU mortality were collected. Analysis was performed using statistical SPSS v13.0 (Chicago, III).

RESULTS. 235 patients were enrolled, 60 (25.3%) of whom were COPD. At baseline COPD patients were older (68.5 vs. 53.4 years, $p < 0.05$), and admitted to ICU for a medical disease more often than NON-COPD (73.3 vs. 40.6%, $p < 0.05$). COPD patients were most severe at admission (APACHE II score; 21.5 vs. 19.5; $p < 0.05$).There were no statistical differences in development of VAP (11.9 vs. 16.0/1,000 MV day) and neither in the length of mechanical ventilation (14.0 vs. 13.4 days). Overall mortality was 26.4%, being higher in COPD group compared to NON-COPD (36.7 vs. 22.9%; $p < 0.05$), even adjusted for severity of illness at admission (HR = 2.07 95% CI 1.22–3.54; $p < 0.05$). Age (55.9 vs. 61.3; $p = 0.03$), COPD (22 vs. 35.5%; $p = 0.03$), APACHE II at admission (19.2 vs. 22.4; $p < 0.05$), SOFA at day 1 (6.5 vs. 8.3; $p < 0.05$) and shock at admission (50.9 vs. 77.4%; $p < 0.05$) were variables associated with ICU mortality in univariate analysis. A multivariate analysis (Cox regression) documented that medical condition (HR = 1.80 95% CI 1.03–3.17); COPD (HR = 1.9 95% CI 1.13–3.42) and shock at admission (HR = 2.1 95% CI 1.05–4.27) were variables independently associated with ICU mortality. Among COPD patients only SOFA score at admission was independently associated whit mortality (HR = 1.16 95% CI 1.01–1.37).

CONCLUSION. COPD was associated with an increased mortality in intubated patients admitted to ICU. Neither development VAP nor the presence other comorbidities were associated with high mortality. The COPD patient outcome was related with development of multiorgan disfunctions.

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0724

PREDICTORS OF PROLONGED MECHANICAL VENTILATION AFTER CORONARY ARTERY BYPASS GRAFTING SURGERY: A RETROSPECTIVE ANALYSIS

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OBJECTIVE. Prolonged mechanical ventilation after coronary artery bypass grafting (CABG) surgery is associated with increased intensive care unit and hospital stay and may contribute to postoperative morbidity and mortality. The objective of this study was to identify the predictors of prolonged mechanical ventilation for patients who had CABG surgery, by evaluating some pre- and intraoperative variables.

METHODS. Consecutive patients who had CABG surgery between December 2004 and December 2007 were retrospectively evaluated. Both reexplorations and patients died after undergoing surgery were excluded. Prolonged mechanical ventilation was defined as longer than 12 h of mechanical ventilation after the surgery. Subjects' preoperative and intraoperative data were recorded.

RESULTS. Of the 455 patients, who were included in the final analysis, 72 (15.8%) required prolonged mechanical ventilation after CABG surgery. Compared with the patients who did not require prolonged mechanical ventilation those who did had significantly higher incidence of intraoperative hypotension, intra-aortic balloon pump and vasopressor requirements ($p = 0.039$, $p = 0.001$ and $p = 0.042$, respectively). Analysis allowed us to identify: increased age (OR = 1.038, 95% CI = 1.009–1.068) and intraoperative muscle relaxant usage (OR = 1.064, 95% CI = 1.008–1.122), as independent predictors of prolonged mechanical ventilation.

CONCLUSION. We have evaluated increased age and intraoperative muscle relaxant usage as perioperative variables that might predict prolonged mechanical ventilation after CABG surgery. Identification of these factors may allow the development of strategies to optimize patient's management.

Acute lung injury: Adjuvant therapies: 0725–0736

0725

PULMONARY SURFACTANT ADMINISTRATION FOR ACUTE RESPIRATORY DISTRESS SYNDROME PATIENTS

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OBJECTIVES. The purpose of this study was to perform exogenous surfactant administration in post-operative patients with acute respiratory distress syndrome (ARDS) to assess whether this therapy may be useful in post-operative patients with ARDS.

METHODS. The primary outcome measure was mortality in 28 days. Secondary measures included oxygenation (PaO_2:FiO_2 ratio) and APACHE II and chest X-ray result. Twenty patients conformed to ARDS criteria and received endotracheal administration pulmonary surfactant (Curosurf, Chiesi, 20 mg/kg per days × 3 days) by Fiberoptic bronchoscopy. Oxygenation, APACHE II and chest x-ray result would be checked.

RESULTS. After pulmonary surfactant therapy in 3 days, oxygenation in 13 patients (13/20) was more significant higher than that before (155 ± 5 vs. 83 ± 3, $P < 0.05$), APACHE II was more significant lower than that before (20 ± 2 vs. 15 ± 2, $P < 0.05$). In 7 days, chest X-ray result in seven patients (7/20) was improved but thirteen patients (13/20) along with interstitial fibrosis. Eleven patients died and nine patients survived (mortality in 28 days = 55%).

CONCLUSIONS. Exogenous pulmonary surfactant administration may improve oxygenation and APACHE II in post-operative patients with ARDS but has not been shown to improve mortality. Whether an effective adjunctive therapy in ARDS, it seems that higher doses administration might yield better efficacy but needs further investigation.

KEYWORDS. Pulmonary Surfactant, Acute Respiratory Distress Syndrome (ARDS).

0726

BRONCHOALVEOLAR LAVAGE (BAL) AND SUPPLEMENTATION WITH EXOGENOUS SURFACTANT IN ADULTS WITH ACUTE RESPIRATORY DISTRESS SYNDROME (ARDS)

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INTRODUCTION. Exogenous surfactant's impact on mortality and respiratory outcomes in adults with ARDS is still controversial, furthermore dosages and ways of administration are not standardized in these patients [1–3]. The aim of our case-control study was to show early effects on respiratory system in adults with ARDS underwent surfactant protocol shared by 13 Italian intensive care units.

MATERIALS AND METHODS. Patients enrolled were adults with ARDS defined by the AECC criteria [4]. Curosurf (porcine surfactant, Chiesi Pharmaceutical, Italy) two-stage protocol was applied within 48 h from the ARDS diagnosis and performed with fiberoptic bronchoscope. First stage was BAL with 240 mg of Curosurf diluted in 100 mL of saline; this volume was then divided in 5 aliquots administered to each pulmonary lobe. After 30 min from the BAL a supplementation with a solution of 240 mg of Curosurf in 10 mL of saline was instilled in each lobe. We matched treated patients with other adults with ARDS. Recruitment manoeuvres were performed at enrolment and every 12 h in each group. We recorded respiratory parameters at enrolment and every 6 h for the first 24 h and Lung Injury (LI) Score at enrolment and after 24 h. We recorded also each possible adverse event. Respiratory variables and LI Score were compared using an ANCOVA model. $P < 0.05$ was considered significant.

RESULTS. 25 patients were treated with Curosurf and 25 patients were enrolled as control group. Twelve patients had indirect ARDS in each group. No statistical differences between the groups were found in age, weight and SAPS II. No adverse events were recorded during the study in the treated group. Results for respiratory parameters and LI Score of the 2 groups are listed in Table 1.

TABLE 1 RESPIRATORY PARAMETERS AND LI SCORE

Parameters	Baseline	6 hours	12 hours	24 hours
PaO_2/	98.8 ± 17.2	99.8 ± 23.8	102.1 ± 21.2	102.2 ± 19.9
FiO_2 Control Curosurf	98.5 ± 29.5	142.0 ± 37.6*	150.6 ± 29.7*	168.4 ± 45.4*
Compliance (mL/cmH2O)	27.2 ± 5.0	26.9 ± 3.1	27.4 ± 4.4	27.7 ± 4.0
Control Curosurf	29.0 ± 3.9	34.6 ± 4.1*	37.0 ± 3.1*	35.2 ± 4.2*
Plateau Pressure (cmH20)	28.1 ± 3.1	28.2 ± 3.4	28.0 ± 3.7	28.4 ± 3.3
Control Curosurf	27.4 ± 4.4	25.2 ± 3.3	23.9 ± 2.1*	25.0 ± 4.2
Tidal volume (mL/kg BW)	7.1 ± 1.2	7.1 ± 1.3	7.2 ± 1.2	7.2 ± 1.5
Control Curosurf	7.1 ± 1.5	7.0 ± 1.4	7.0 ± 1.0	7.0 ± 1.5
Lung Injury Score	2.9 ± 0.2			3.0 ± 0.3
Control Curosurf	2.8 ± 0.5			2.3 ± 0.5*

*$p < 0.05$

CONCLUSIONS. In our protocol we administered a total amount of 1,440 mg of Curosurf that means approximately 1,425 mg of phospholipids (PHL), a much lower concentration of PHL compared with previous studies [1–3]. Our two-stage protocol rises from the belief that higher dosages instilled in many studies are related to the inactivation of the exogenous PHL by the inflammatory mediators released in the ARDS lung that could be partly removed with a BAL, as reported in paediatric patients [5], before the supplementation.

Early benefits on oxygenation and static compliance and LI Score improvement at 24 h in the treated group could identify our protocol with Curosurf as a supportive "bridge" to the etiological resolution of the ARDS in adults, however, a randomized controlled trial is mandatory to confirm these results.

0727

EXTRA-CORPOREAL LUNG SUPPORT AS AN ALTERNATIVE TO MECHANICAL VENTILATION

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INTRODUCTION. In respiratory failure extra-corporeal lung support (ECLS) plays a rescue role complementary to non effective mechanical invasive ventilation. However, in certain cases we can indicate alternative uses of it: as to maintain a non-invasive ventilation (NIV) no longer effective, to artificially replace the injured lungs and to avoid risks and complications due to mechanical ventilation.

AIM OF THE STUDY. To review the use of ECLS in non-intubated patients on NIV, in our ICU.

PATIENTS AND METHODS. In the last 18 months four adult patients were treated with ECLS+NIV: pumpless arterial-venous (pav) technique was used in three patients waiting for lung transplant, whereas a veno-venous (vv) technique was used in an immunosuppressed patient suffering from P. Carinii pneumonia.

RESULTS. The vvECLS + NIV association, applied for 5 days, was a successful bridge-to-recovery for the patient suffering from pneumonia. In one of the three patients waiting for lung transplant, the pavECLS + NIV association, applied for 1 day, was a successful bridge-to-transplant, with patient recovery. In another case, after 3 days it was necessary to switch from pavECLS + NIV to invasive ventilation and vvECLS, thus supporting the patient until the transplant was successfully performed. The third patient waiting for lung transplant was intubated after 13 days on pavECLS + NIV, and died after 32 days of ECLS, before the organ was available.

CONCLUSIONS. In patients with a good level of consciousness and affected by a reversible pathology or candidates to lung transplant, ECLS can be added to NIV with the purpose to avoid or postpone invasive ventilation. We applied this approach in patients with low risk of complications due to ECLS and high risk of complications due to invasive ventilation. By adding ECLS, invasive ventilation was avoided in two patients, and postponed in two patients. Three of four patients were successfully discharged from the hospital. Veno-venous ECLS was found to be more effective than pumpless arterial-venous ECLS to prevent the need of invasive ventilation.

0728

A NEW METHOD FOR REDUCING THE RISK OF OXYGEN TOXICITY IN APNOEIC OXYGENATION WITH EXTRACORPOREAL CO_2 REMOVAL

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INTRODUCTION. We have shown that apnoeic oxygenation (AO) combined with extracorporeal CO_2-removal (AO-ILA) can maintain adequate oxygenation and gas exchange in an animal model of acute lung injury (ALI) [1]. However, we have further shown that if an inspiratory fraction of O_2 (F_iO_2) <1.0 is used during AO, alveolar accumulation of N_2 quickly leads to arterial hypoxemia (unpublished data). Thus, F_iO_2 1.0 is mandatory when using AO-ILA. This is a potential disadvantage for AO-ILA, since this high alveolar O_2 concentration might be toxic. We hypothesized that if N_2 is trapped in the lungs before AO with F_iO_2 1.0 is initiated, a non-toxic alveolar O_2 concentration could be obtained while providing adequate arterial oxygenation. The aim of this animal study was to test whether using F_iO_2 0.5 before AO (thus trapping N_2 in the lungs) could give and maintain adequate oxygenation.

METHODS. The study was approved by the animal ethics committee. Eight 70 kg pigs were anaesthetized and intubated. The following series was conducted in a random sequence: Series 1 and 2; F_iO_2 before AO: 0.5; F_iO_2 during AO: 0.5; CPAP (continuous positive airway pressure): 10 or 1 cmH_2O. Series 3 and 4; F_iO_2 before AO: 0.5; F_iO_2 during AO: 1.0; CPAP: 10 or 1 cmH_2O. AO was performed for 20 minutes or until peripheral O_2 saturation (S_pO_2) <60%. Blood gasses were drawn at regular intervals.

RESULTS. Results are median (range). In series 1–2 arterial partial pressure of O_2 (P_aO_2) decreased below 52 mmHg within 6 min in all animals. In series 3 P_aO_2 decreased from 274 (233–291) mmHg to 80 (69–98) mmHg within 5 min, but maintained at this level during the 20 min study period. Arterial O_2 saturation (S_aO_2) decreased in two phases: A quick decrease to 94 (89–99)% during the first 3 min, and then linearly to 79 (72–82)% during the rest of study period. In series 4, P_aO_2 decreased from 281 (227–307) mmHg to 63 (52–73) mmHg within 5 min and maintained at that level. However S_aO_2 fell below 60% in 2 pigs within 15 min.

DISCUSSION/CONCLUSION. Using $F_iO_2 < 1.0$ before AO and continuing with F_iO_2 1.0 during AO seems to be a feasible method to achieve an acceptable alveolar O_2 concentration during AO. In this exploratory study, without extracorporeal CO_2-removal, the initial fast decline in P_aO_2 was probably due to trapping of the dead space N_2 into the alveoli, while the following slow decline was due to alveolar CO_2-accumulation. The difference between series 3 and 4 was probably caused by the lower relative dead space/gas exchange space ratio with CPAP 10 causing less initial N_2 accumulation in the gas exchange space. If the method should be used to reduce the alveolar O_2 concentration in AO-ILA, measurement of dead space and FRC would thus be helpful to calculate the F_iO_2 to be used before AO-ILA in order to obtain a safe alveolar O_2 concentration.

REFERENCE. 1. Nielsen ND et al (2008) ASAIO J. 54:401–405.

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0729

CONVENTIONAL CONVECTIVE VENTILATION IS NECESSARY TO PREVENT ALVEOLAR ACCUMULATION OF NITROGEN: A STUDY DURING APNEIC OXYGENATION AND EXTRACORPOREAL CO_2 ELIMINATION

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INTRODUCTION. It has been suggested that ventilation with very low tidal volumes (V_t) would be beneficial in acute lung injury (ALI). We have recently shown that using an inspiratory fraction of oxygen (F_iO_2) of 1.0 in apnoeic oxygenation (zero V_t) combined with pumpless extracorporeal CO_2 removal (AO-ILA) could maintain excellent oxygenation and normocapnia in a lung recruited, animal ALI-model for 8 h [1]. However, during pilot tests with $F_iO_2 < 1.0$, hypoxemia developed within 30 min. Based on old studies [2], we hypothesized that this impairment of arterial oxygenation was due to alveolar N_2 accumulation. However, fast absorption of N_2 in collapse prone lung regions after denitrification could not be excluded. The aim of this study was therefore to assess the rate of development of hypoxemia, the alveolar gas content after 20 min, and atelectasis formation using AO-ILA with a F_iO_2 of 0.5.

METHODS. The study was approved by the Danish National Animal Ethics Committee. Four pigs (median weight: 69 kg) was anaesthetized and intubated. Mild lung injury was induced by repeated alveolar lavage after which the lungs were recruited and then ventilated with a F_iO_2 of 1.0 and a positive end-expiratory pressure (PEEP) of 10 cmH_2O for 30 min. A pumpless membrane lung (iLA Membrane Ventilator, Novalung, Germany) was connected in an arteriovenous shunt for CO_2 elimination. A new lung recruitment manoeuvre was performed and the tracheal tube was connected to a constant airway pressure of 20 cmH_2O and a F_iO_2 of 1.0 or 0.5. In each animal AO-ILA was performed in two series of 20 minutes with the two oxygen concentrations, while arterial oxygenation was monitored by repeated arterial blood samples. After each 20 min period the alveolar fractions of oxygen and CO_2 (F_AO_2 and F_ACO_2) were measured. Subsequently formation of atelectasis during AO-ILA with F_iO_2 of 1.0, respectively 0.5 was assessed by computed tomography (CT).

RESULTS. All values are median (with range). After 20 min of AO-ILA with a F_iO_2 of 0.5 arterial partial pressure of oxygen (P_aO_2) decreased to 48 (36–56) mmHg (10% of baseline), whereas when a F_iO_2 of 1.0 was used P_aO_2 was maintained above 400 mmHg even after 20 min. When a F_iO_2 of 0.5 was used F_AO_2 was 0.07 (0.06–0.09) and F_ACO_2 was 0.08 (0.07–0.08) after 20 min of AO-ILA, indicating an alveolar N_2-concentration of about 85%. With neither F_iO_2 any new atelectasis was found by CT.

CONCLUSION. When apnoeic oxygenation is used in combination with extracorporeal CO_2 removal, a F_iO_2 of 1.0 is essential to avoid alveolar nitrogen accumulation and arterial hypoxemia.

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0730

IS MOBILE EXTRACORPOREAL MEMBRANE OXYGENATION A SAFE TOOL TO TRANSFER SEVERELY HYPOXAEMIC PATIENTS BECAUSE OF ACUTE RESPIRATORY DISTRESS SYNDROME OR CARDIAC FAILURE?

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BACKGROUND AND AIM. Acute respiratory distress syndrome (ARDS) is still a syndrome with a high mortality rate. Although the improvement of therapeutic measures, some patients (pts) remain severely hypoxaemic. In such pts, Extracorporeal Membrane Oxygenation (ECMO) may be an additional therapeutic option. However, inter-hospital transfer of pts who need an ECMO can be very dangerous because extreme hypoxaemia or haemodynamic instability may be associated with cerebral hypoxia and death. In this work, we report our experience on mobile ECMO system initiated in the referal hospital to secure transfer.

METHODS. Our database was retrospectively analyzed and we report on 15 consecutive pts transferred to our hospital under ECMO assistance. 12 of them required this technique because of ARDS refractory to conventional treatment and the other 3 because of cardiocirculatory failure unresponsive to best therapy. Percutaneous veno-venous (VV; $n = 11$) or veno-arterial (VA; $n = 4$) ECMO support consisted of a single membrane oxygenator and a centrifugal pump. All the pts were ventilated, sometimes with an associated nitric oxide delivery system and the transfer monitoring equipment included a pulse oxymetry, an ECG and an invasive pressure. Three persons composed the transfer team (1 experienced ICU physician, 1 nurse and 1 ECMO specialist) and the transport was always by ambulance.

RESULTS. The transfer of all pts was feasible thanks to a systemic oxygenation and haemodynamic status improvement by the ECMO, after a median door-to-door transfer time of 73 min (range 26–105). No significant complication was noted during the transfer except a transient loss of electric power supply. In ARDS pts, PaO_2/FiO_2 improved from 52.5 mmHg (range 26–66.4) to 111 mmHg (range 47–271) and from 62 mmHg (range 45–88) to 327 mmHg (range 250–390) by the cardiac pts, respectively, before and after the initiation of ECMO. The mean weaning length for the ECMO system was 7 days. Mean ICU and hospital stay duration was, respectively, 21 days (range 1–55) and 31 days (range 1–110). Four pts died because of brain death due to neurotrauma, pneumonia, candidemia and hemorrhagic abscesses associated to a subarachnoidal hemorrhage, with a mean period of 5 days after the initiation of the ECMO system. One pt died a few days after his transfer from the ICU to pneumology department, after a 47-day length stay in the ICU. Our mortality rate at 1 month is 26.6% which seems better than other results reported. All pts suffering from cardiogenic shock survived, after combined cardiac surgery.

CONCLUSION. In severely hypoxaemic pts, ECMO support seems to be a good tool for a safe transfer, with an experimented team. It provides the possibility of recovering functional lung or heart. Cardiocirculatory failure appears as a preferential indication. Further randomized control trials are needed to confirm our results.

0731

TGI, TRACHEAL GAS INSUFFLATION DURING THE MECHANICAL VENTILATION IN CHILDREN

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OBJECTIVES. Undesirable hypercapnia even with satisfactory oxemia can occur during the initial hours of mechanical ventilation therapy of serious pulmonary disorders. It is a result of imperfect gas exchange on the alveolo-capillary membrane. Prolonged hypercapnia induces a cascade of hemodynamically inconvenient adaptation mechanisms. Peripheral vasodilatation, systemic hypotension and compensatory tachycardia appear. There is a decrease of the sensitivity of myocardial adrenergic receptors, the contractility and the cardiac output.

Hypercapnia can be effectively decreased by TGI during mechanical ventilation.

METHODS. TGI is indicated in order to eliminate CO_2. It is an unconventional supplement to mechanical ventilation. This method requires the use of a special tracheal cannula of the Boussignac type. With the flow of 1–2 l/min the cannula enables tracheal insufflation of the moist and tempered gas independently of the inspiratory cycle of the device. The continuous insufflation literally "splashes" the alveoli. The result is a very effective and rapid elimination of CO_2. The insufflated gas does not take part in the diffusion on the alveolo-capillary membrane.

RESULTS. The authors present their experience from 33 cases of serious pulmonary disorders in children when they used TGI in order to solve persistent hypercapnia during complicated mechanical ventilation.

CONCLUSIONS. The decrease of hypercapnia contributes to the quick adjustment of the sensitivity of myocardial adrenergic receptors and to the normalisation of the contractility and the cardiac output. After the elimination of CO_2 it is possible to set the ventilator back to the conventional mode of mechanical ventilation.

KEYWORDS. TGI, hypercapnia, mechanical ventilation, children.

0732

DEVELOPMENT OF AN AUTOMATED OXYGEN DELIVERY DEVICE FOR SPONTANEOUSLY BREATHING PATIENTS—THE FREE O_2 PROJECT—PRELIMINARY RESULT

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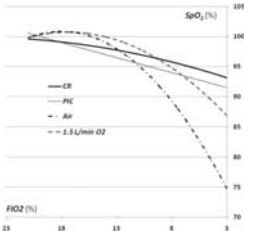
Oxygen is often given by medical and paramedical staff, and treatment should be targeted to saturation and adjusted to patients condition.

OBJECTIVES. Automation of oxygen administration has the potential to reduce clinicians workload and to improve both compliance to protocols and patients safety.

METHODS. Free O_2 was designed as a closed-loop administration device based both on a proportional integral control (PIC) and on knowledge-transfer of clinical rules (CR). It is dedicated either to be used for adult or pediatric patients, in hospital or in community settings. These algorithms were embedded in a miniaturized computer connected to a side-stream capnograph and oxygen saturometer as inlet parameters, and to an electronic solenoid valve as outlet parameter. Input parameters were measured each second, and O_2 flow adjustments were performed each 3 s. Data are continuously monitored and stored in the computer internal memory (up to 6 months continuous monitoring). Prototype performance was validated on healthy volunteers, while inducing progressive decremental hypoxic conditions (FIO_2 21–3%).

RESULTS. As compared to air or continuous O_2 breathing, both CR and PIC allowed to limit oxygen desaturation, whatever the hypoxic condition. In less than half an hour, more than 2,000 measurements and a mean 500 flow adjustements were performed by controlers with Free O_2 (CR and PIC). Transient oxygen desaturation (<85%) occurred in 100% cases at FIO_2 5 and 3% without oxygen, in 13% under O_2 continuous flow and PIC and in 17% under CR regulation at FIO_2 3%. Mean SpO_2 was below 83% under air, 87 ± 1.6% under O_2, and >90% either under PIC or CR at FIO_2 3%.

CONCLUSION. Automation of oxygen administration is feasible and effective. FreeO_2, either using PIC or CR algorithms has the potential to improve patients' safety and to reduce clinicians' workload. Allowing frequent and rapid oxygen flow adjustments, it may be specifically indicated in highly unstable hypoxemic patients, in patients with transient nocturnal desaturation, or in patients at risks of hypoventilation (Fig. 1)



FIO_2/SpO_2 relation according to different settings

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0733

EXPERIMENTAL BENCH-TEST EVALUATION OF EXPIRATORY LINE PROTECTION DURING AEROSOLIZATION UNDER MECHANICAL VENTILATION—IMPACT OF THE FILTER TYPE AND HUMIDIFICATION MODALITIES

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INTRODUCTION. There are no standards for expiratory line protection while performing aerosols under mechanical ventilation. Different types of filtering devices are used in routine (mechanical, hygroscopic, hygrophobic), in order to avoid flow transducers dysfunctions induced by gas-flow increased resistance.

OBJECTIVES. The objectives of this experimental bench-study were: (1) to validate the manufacturers' data about existing filters' characteristics; (2) to evaluate the performance of these filters, according to different types of humidification circuits; (3) to validate the use of a specifically dedicated expiratory line protection filter (ServoGuard, Maquet).

METHODS. A respiratory system analog was build up using a 1L test lung and an Evita 2 dura ventilator (Dräger Médical). Colimycine aerosolization was performed using a continuous 6 MU dose, delivered by a piezoelectric aerosolisor (Aeroneb pro). A Fisher-Paykel MR850 heated-humidifier was connected to different types of circuits (unheated, single heated RT212, biheated—new [RT340] and old [RT100] generation). The experimental device comprised a slotted measuring section of both flow and pressures transducers (IMT PF300); Measurements were carried out using continuous flow (ranging from 10 to 100 L/min) and constant temperature (21°C). Basal characteristics were obtained from each filter still dry. Same measurements were performed after 12 and 24 h of continuous in vitro use, under each experimental condition. We considered as a security limit a maximal increase of resistive pressure not to exceed 6.0 cmH_2O whatever flow, even when saturated.

RESULTS. At baseline, all dry filters remained below the security limit. However, three categories of filters intrinsic performances could be individualized: low resistance ($n = 2$); intermediate ($n = 8$); and high resistance to flow ($n = 2$). During aerosolisation, the Servoguard allowed an effective protection of the circuit (for up to 48 h) whatever the type of humidification circuits, at the notable exception of the unheated circuit. Several occlusions occurred with other types of filters before the first 12 h of use, especially for HME who were sometimes occluded after a short period of use (from 2 to 7 h). Standard mechanical filters allowed a satisfactory expiratory line protection, but only in case of biheated circuits.

CONCLUSION. Expiratory circuit protection is likely to involve brutal occlusions under aerozolisation, mostly related to the humidification mode, as the filter material density increases after several hours of use. This concept must be taken into account from a patients' security point of view. New generation biheated circuits and specifically dedicated filters should be put forward.

This experiment was made possible by a grant from Maquet France SA

0734

ADVANTAGES OF REMIFENTANIL VERSUS INTERMITTENT BOLUSES OF MIDAZOLAM/TRAMADOL SEDATION FOR MECHANICALLY VENTILATED PATIENTS

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INTRODUCTION. Hypnotic-based sedation (HBS), where midazolam was used, with tramadol as needed has been common. The invention of remifentanil has allowed greater use of analgesia-based sedation (ABS) with relief of discomfort from the tracheal tube or pain.

OBJECTIVE. The aim of this study was compared the safety and efficiency of an analgesia-based sedation regime using remifentanil with a conventional hypnotic-based sedation regime in patients requiring prolonged mechanical ventilation for up to 72 h.

METHODS. In this prospective, randomised, single-centered study, a total of 60 patients (56–75 years old), who had undergone abdominal surgery, were postoperatively assigned to one of two treatment regiments for sedation in the ICU for 12–72 h. Patients in the ABS group ($n = 30$) received remifentanil (6–9 $\mu g\ kg^{-1}$ per hour). Patients in the HBS group ($n = 30$) received midazolam (0.02 to 0.2 mg $kg^{-1}\ h^{-1}$) and tramadol (100 mg/6 h). Patients were sedated to an optimal Riker Sedation-Agitation Scale (RSAS) score of −1 or 1, Remsy score (RS) of 1–3 and a pain intensity (PI) score of 0 or 2. SAS, PI, heart rate (HR) and mean arterial pressure (MAP), APACHE ll and SOFA score were continuously monitored throughout the treatment period and were recorded at the time of each bolus dose and/or change in infusion rate of any of the study drugs. Adverse events were recorded from the start of the study drug until the end of the post-treatment period.

RESULTS. 30 patients received ABS, 29 of the patients receiving remifentanil without the use of supplementary hypnotic agents. In the HBS 20/30 of patients either morphine or fentanyl was used as the analgesic agent, titrated to obtain adequate pain control. The variation in the mean RSAS over 24 h was −1 to +1 for remifentanil group and −2.7 to +3.0 in the comparator group. The variation in the mean PI over 24 h was 1.5–1.6 for the remifentanil group and 1–3.7 for the comparator group. Variation of MAP, HR, pCO_2 was less in remifentanil than in control group.

CONCLUSIONS. Analgesia-based sedation with remifentanil was well tolerated. No significant statistical difference in duration of mechanical ventilation of critically ill patients and total mortality rate is noticed, but it is decided that it definitely improves the healing process in comparison to standard hypnotic-based sedation regimes in ICU patients requiring ventilation for up to 72 h.

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0735

IMPACT OF THE ROUTE OF APPLICATION OF ACETAZOLAMIDE ON HYPOXIC PULMONARY VASOCONSTRICTION (HPV)

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INTRODUCTION. The carbonic anhydrase (CA) inhibitor acetazolamide (ACZ) reduces HPV in isolated lungs, intact animals and in humans.

OBJECTIVE. The aim of the study was to determine the most effective route of administration with respect to reduction in pulmonary artery pressure and plasma ACZ concentrations. The higher the plasma concentration of ACZ the greater the side effects of ACZ, e.g. acid base disturbances due to sodium bicarbonate excretion. We therefore studied the impact of inhaled, intravenous and oral ACZ administration routes on the pulmonary vascular pressure response in conscious, spontaneously breathing dogs during acute hypoxia.

METHODS. Eight female Beagle dogs were kept under standardized environmental conditions. Each dog was studied four times in randomized order. Protocol (1): Controls; (2): inhaled ACZ (750 mg); (3): ACZ IV (2 mg/kg bolus and 2 mg/kg per hour continuously); (4): oral ACZ (5 mg/kg twice, 12 and 1 h before the experiment). During all experiments, dogs breathed spontaneously via a ventilator circuit. First hour: normoxia ($F_iO_2 = 0.21$); followed by 2 h of hypoxia ($F_iO_2 = 0.1$–0.09). Arterial oxygen tension (P_aO_2), mean pulmonary artery pressure (MPAP), pulmonary vascular resistance (PVR), acid-base changes and ACZ plasma levels were determined at the end of each experimental hour. Data are given as mean ± SEM; $p < 0.05$ (GLM ANOVA).

RESULTS. During hypoxia P_aO_2 was 36–38 ± 1 mmHg in all protocols. In Controls, MPAP increased from 13 ± 1 (normoxia) to 20 ± 1 mmHg and PVR from 269 ± 18 to 473 ± 33 dyn s cm^{-5} with hypoxia. With "ACZ inhaled" MPAP was 13 ± 1 mmHg and PVR 298 ± 21 $dyn{\cdot}s{\cdot}cm^{-5}$ during normoxia and did not increase during hypoxia (16 ± 1 mmHg and PVR 388 ± 30 $dyn{\cdot}s{\cdot}cm^{-5}$) but prevention of HPV was more pronounced with "ACZ IV" (MPAP 14 ± 1 mmHg; PVR 335 ± 29 $dyn{\cdot}s{\cdot}cm^{-5}$ during hypoxia). Oral administration of ACZ—in the dosage used—could not prevent an increase in MPAP from 13 ± 1 to 18 ± 1 mmHg, and PVR from 310 ± 21 to 485 ± 50 during hypoxia. ACZ plasma levels during hypoxia where 8.5 μg/ml (IV), 3.4 μg/ml (inhaled) and 3.1 μg/ml (oral).

CONCLUSION. Inhaled ACZ is absorbed via the pulmonary epithelium and reduces HPV in conscious dogs. However, it appears not to be possible to selectively reduce HPV through ACZ inhalation. We found typical systemic effects of CA inhibition through ACZ spill over into the systemic circulation when ACZ was inhaled. Hypoxic pulmonary vasoconstriction was most effectively reduced by intravenous delivery of ACZ, but plasma concentrations were also highest during this route of application.

0736

PULMONARY AND HEMODYNAMIC RESPONSES TO FRUCTOSE-1,6-DIPHOSPHATE IN PATIENTS WITH LUNG INJURY

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Experimental data indicates that treatment with Fructose-1,6-Diphosphate (FDP) significantly reduces lung injury caused by α-naphtylthiourea, sepsis and endotoxemia. Based on these observations, this study investigated the possibility of improving pulmonary function and hemodynamics by adding FDP to standard therapy to treat patients with acute respiratory failure (ALI/ARDS). We used a non-randomized design in which each patient served as his own control. Treatment with IV FDP (Esafosfina™) 10% 150 mg/kg Q6H for an average of 18 ± 2.9 infusions was given to 40 consecutive patients with ALI/ARDS resulting from complications of sepsis, trauma, aspiration, near drowning, smoke inhalation, and following heart and lung transplantations. FDP treatment was discontinued after substantial improvement of oxygenation and hemodynamics. Pulmonary function parameters before (B) and after (A) FDP treatment are given below and expressed as means ± SEM; $*P < 0.001$.

Pulmonary artery pressure, resistance and PWP declined following FDP treatment from 27.8 ± 1.5 to 22 ± 1.4 mmHg; 390 ± 31 to 248 ± 20 dyn cm s^{-5} ($P < 0.001$) and 14.4 ± 1.03 to 11.8 ± 1.17 mmHg ($P < 0.001$) and so did heart rate ($P < 0.001$) while arterial pressure and cardiac output increased ($P < 0.001$). At 45 days post treatment, 30 of the 40 patients were alive (75%). As the study is non-randomized, no conclusion can be drawn on survival. The observed improvement in pulmonary function by FDP was most likely due to its known capabilities to curtail oxyradicals generation by neutrophils and suppress inflammatory cytokines expression. Hemodynamic improvement is attributed to the pharmacodynamic properties of FDP to enhance energy production from glycolysis in hypoxia (Table 1)

TABLE 1 RESULTS

PEEP-cmH_2O		O_2%		PaO2 mmHg		PaO_2/FiO_2 Index	
B	A	B	A	B	A	B	A
9.6 ±0.7	6.1* ±0.93	62 ±3.3	42* ±2.03	73 ±3.4	101* ±3.4	130 ±8.4	260* ±15.3

Complicated infections: 0737–0749

0737

OUTCOME OF PATIENTS WITH CERVICAL NECROTIZING FASCIITIS TREATED ACCORDING TO THE KAROLINSKA HOSPITAL GUIDELINES 1998–2008

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INTRODUCTION. Cervical necrotizing fasciitis (CNF) is a serious, rapidly progressive infection along fascia planes that sometimes involves skin, subcutaneous and muscle tissue. The condition, often of dental or pharyngeal origin, is feared due to rapid progress and a mortality rate of up to 25% or more (Krenk et al.). Karolinska University Hospital has since 1998 used guidelines to ensure rapid recognition of the diagnosis and treatment of these patients. The guidelines advocates a multidisciplinary approach with

1. imipenem/cilastatin and clindamycin and, if in septic shock, one dose of gentamicin,
2. early extensive, tissue-saving debridement,
3. hyperbaric oxygen (HBO) therapy for intermittent oxygenation of infected hypoxic tissues,
4. frequent CT scans or MRTs to assess the need for repeated surgical intervention.

OBJECTIVES. To report the outcome of CNF at Karolinska University Hospital during 1998–2008.

METHODS. Medical charts were analysed retrospectively for all patients treated according to the Karolinska Hospital guidelines for CNF during 1998–2008. Fifty-two cases of CNF were found, aged 19–89 years (mean 52 ± 16), 31/52 males, 48/52 patients were treated in the intensive care unit.

RESULTS. Forty-nine of the fifty-two patients recovered, all deaths were in the intensive care group. Streptococcus of the milleri group were the predominant pathogens found in initial tissue cultures.

The intensive care patients had an APACHE II score of 3–37 (mean 16 ± 8), a mean time on ventilator 12 (±11) days, 34/48 (71%) were treated with inotropic drugs and 8/48 (16.7%) with inotropic drugs and dialysis. Mean length of stay in intensive care in Karolinska University Hospital was 16.6 (±18.6) days.

Expected mortality rate according to APACHE II score for septic patients would have been 26%, our 90 day mortality rate was 6.2%.

CONCLUSION. Our case series has demonstrated that patients with CNF treated according to the Karolinska Hospital guidelines including HBO have an outcome with a 90 day mortality considerably lower than that indicated by their APACHE II score. The results are similar to those found by Krenk et al. (2007).

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GRANT ACKNOWLEDGEMENT. None.

0738

NECROTIZING SOFT TISSUE INFECTIONS—A PROSPECTIVE STUDY OF 145 PATIENTS TREATED AT A SINGLE INSTITUTION

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Over a recent 10-year period, 145 patients with necrotizing soft tissue infections (NSTI) were admitted with illness severe enough to warrant intensive care unit (ICU) confinement. Comprehensive patient data was entered prospectively into a customized NSTI registry and forms the basis of this report.

AIMS. The purpose of this study was to identify factors critical to survival, compare clinical observations with empirical data and experiences of other investigators, and develop clinical strategies for improved outcome.

METHODS. From 1995 to 2005, all ICU patients with NSTI were entered into a database which included demographics, causative and predisposing factors, co-morbid conditions, complications, sequential organ failure assessment scores (SOFA), site if infection, bacteriology, outcome and other data elements. These data were carefully defined, aggregated, and subjected to statistical review.

RESULTS. Patients ranged in age from 14 to 74 years. Overall survival was 80%. Factors which threatened survival included age >60 years ($p < 0.01$), >2 co-morbid risk factors ($p < 0.02$), hypertension, and obesity. Underlying kidney disease was not a risk factor but the development of renal failure was highly lethal ($p < 0.001$). Patients who died had longer duration of symptoms prior to treatment, were more likely to have anatomic involvement of the thigh, buttock or abdomen, and culture positive for streptococci, coliforms or bacteroides. Shock at presentation ($p < 0.001$) and the development of multi-organ failure ($p < 0.001$) were independent threats to survival. Although both diabetes mellitus and NSAID use occurred in >50% of patients, neither independently affected survival.

CONCLUSIONS. NSTI causes serious illness with a mortality of 20% in this study. Aggressive initial treatment to restore tissue perfusion of patients presenting hypotensive and proactive efforts to prevent multi-system organ failure can improve survival. The elderly, hypertensive or obese patient is at particular risk. Infection site and bacteriology appear to be important survival determinants, defining a role for both aggressive debridement and tailored antimicrobial therapy.

0739

CERVICAL NECROTIZING FASCIITIS AND ITS OUTCOME

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BACKGROUND. Necrotizing fasciitis (NF) is a rapidly progressing infection of the fascia and subcutaneous tissue. NF is a surgical emergency, if not diagnosed early and treated properly, it can be fatal. NF is common in the groin, abdomen and extremities, but rare in neck and head area. Cervical NF however is an aggressive infection of neck- and head area with devastating complications including airway obstruction, pneumonia, pulmonary abscess, jugular vein thrombophlebitis, mediastinitis and septic shock. The mortality rate is high (12–30%).

AIM. To assess presentation, risk factors, co-morbid diseases, type of infection, severity of the disease and intensive care outcome of cervical NF.

METHODS. The medical records of 94 patients treated for necrotizing fasciitis in the surgical intensive care unit (SICU) of Hamad Medical Corporation, from January 1995 to February 2005 were reviewed retrospectively.

RESULTS. Out of 94 patients, 5 patients had cervical NF, this accounts for 5.3% of all patients. The mean age was 41.2 ± 14.8 years with 4 patients being male. Sixty percent of patients had an operative procedure as predisposing factor and 80% of patients received non-steroidal anti-inflammatory drugs (NSAID) before admission. The only co-morbid disease was diabetes mellitus (60%). All NF patients were febrile on admission and had leucocytosis (WBC of 17.1 ± 7.0). The mean sequential organ failure assessment (SOFA) score on admission to SICU was 8.8 ± 3.6. During the initial 24 h post admission, these patients received an average of 5.8 ± 3.0 l of IV fluid, 2.0 ± 1.4 units of packed RBC, 4.8 ± 3.6 units FFP and 3.0 ± 4.5 units of platelet concentrate. All patients had surgical debridement done at least two times, were intubated for 5.2 ± 5.1 days and stayed in SICU for 6.4 ± 5.2 days. Antibiotic treatment consisted of piperacillin/tazobactam in three patients (60%): one patient grew *Escherichia coli*, one patient grew S*treptococcus pyogenes* and one patient grew *Streptococcus pyogenes* plus *Staphylococcus aureus.* Piperacillin/tazobactam was combined with clindamycin in 1 patient growing *Peptostreptococcus spp.*, and meropenem was used in 1 patient growing *Enterobacter cloacae*.

Sixty percent of cases had multiorgan dysfunction syndrome (MODS) and one patient died.

CONCLUSION. Cervical NF remains a severe type of infection with devastating complications. In this small study, we found only DM to be an associated co-morbid condition.

0740

INTRAOPERATIVE RISK FACTORS ON SURGICAL WOUND INFECTION. MULTICENTRE STUDY IN 59 CATALONIAN HOSPITALS

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INTRODUCTION. Surgical wound infection (SWI) is a common and important complication of surgery. Co-morbidities patient and accurately intraoperative management of them are relevant factors of its incidence.

OBJECTIVES. To establish incidence of SWI and identify intraoperative risk factors that can increase it.

METHODS. Prospective, observational, multicentre study from one year (2006–2007) in 59 hospitals of Catalonia.Variables assessed: type of incision, position, type of anesthesia, respiratory parameter, administration of muscle relaxant, nausea/intraoperative vomiting, bronchoaspiration suspicion, respiratory complications (bronchospasm, desaturation, hypercapnia, high airway pressure), cardiovascular complications, blood transfusion, volume input, bleeding, surgery length, length of anaesthesia (hours). Chi-square and T-student test were analysed.

RESULTS. 2,991 patients were studied. 50.7% male and 49.3% female; elective surgery 70.7%; emergency surgery 11.8% and ambulatory major surgery 17.5%; ASA I 30%, ASA II 52.2%, ASA III 16% and ASA IV 1.8%. Intraoperative blood transfusion 3.8%. 13.7% suffered from postoperative complications, 5% suffered from respiratory complications, 4.2% cardiovascular ones and 4.7% suffered from SWI. Next variables have shown high significance on SWI: incision (p 0.000) high incidence in sternotomy/thoracotomy/medium laparotomy and subcostal incision (14.8%); position (p 0.000) hyperextended supine position had more frequent SWI (17.4%); type of anesthesia (p 0.010) highest on general anesthesia (5.8%) and combined one also (7.0%); airway high incidence in nasotraqueal intubation (7.1%) and having a tracheostomy previous to anesthesia induction (28.6%); needs of therapeutic maneuver of alveolar recruitment (p 0.007); need of PEEP (p 0.003); muscle relaxant administration during surgery period (p 0.000); extubation deferred (p 0.000); hypercapnia (p 0.005); desaturation event (p 0.007), arterial hypotension (p 0.042); bleeding (p 0.000), blood transfusion (p 0.000), length of surgery (p 0.000) and length of anaesthesia (hours) (p 0.000).

CONCLUSIONS. Despite improvements in prevention SWI is as frequent as others medicals postoperative complications, we should emphasize on all the measures that can decrease its occurrence. About intraoperative measures we should take special attention on maintain good perfusion and good tissular oxygenation, keep special attention on aseptic surgery and being accurately in management of general anaesthesia and transfusion. We should emphasize do not forget patient co-morbidities and its optimisation before surgery.

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RETROSPECTIVE ANALYSIS OF VASCULAR SURGICAL PATIENT ADMITTED AT THE INTENSIVE CARE UNIT IN THE LAST SIX YEARS

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INTRODUCTION. The number of vascular surgery patients is increasing worldwide. Their characteristics should be updated after the development of cardiovascular treatments.

OBJECTIVE. Review the morbidity and mortality of patients admitted at intensive care unit (ICU) in the postoperative period of a vascular surgery intervention, in the last 6 years.

METHODS. A retrospective medical record review of all patients admitted at the ICU from 2002 to 2008 was performed.

RESULTS. From 3,054 patients admitted at the ICU, 57 (1.8%) were in the post-operative period of a vascular surgery intervention. The average age was 63.4 ± 14.8 years. The majority, 37 (64.9%) were males and 21 (42.8%) had non elective operation. The mean ICU stay was 8.23 ± 6.9 days. The main diagnoses at admission were respiratory insufficiency. Twenty-three (40.4%) were submitted to aortoiliac interventions. Hypertension was the most prevalent (36 patients) risk factor and thirteen patients had more than three risk factors. Co morbidity: 26 (45.6%) had coronary artery disease (defined as history of angina or acute myocardial infarction), 23 (40.3%) peripheral vascular disease and 20 (35.1%) aneurismatic disease. The overall mortality was 18.2% and the main cause was acute respiratory distress syndrome (ARDS).

Conclusions. Comparing the results of this small study with the published literature, it was evident that mean age was inferior, but mortality and mean ICU stay was superior in this sample. We realized that this two data were related: patients who died had a superior mean ICU stay (13.1 days). This could be explained by the huge number of aortoiliac intervention and the high prevalence of clinical coronary heart disease. Nevertheless, we suspect that the real prevalence of this disease is superior. It was just analysed the presence of symptomatic pathology. The most frequent risk factor was hypertension; probably due to its huge prevalence in Portuguese population. However, we suppose that risk factors were understated, consequently to incomplete records registration. It is emphasized ARDS is the leading cause of death. This fact is according to recent literature. Respiratory complication is the major source of mortality, contradicting the traditional data that cardiac disease was the main cause of death, and reflecting the improvements in cardiac field.

The high mortality rate, caused by ARDS in a young sample with cardiovascular risk factors stresses the attention that should be given to pulmonary lung diseases.

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0742

MICROBIOLOGICAL EVOLUTION AND PROGNOSIS IN INTENSIVE CARE UNIT OF PERITONITIS WITH MULTIPLE RELAPAROTOMY

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INTRODUCTION. The persistence or recurrence of intra-abdominal sepsis during care of community or postoperative peritonitis is usually defined as tertiary peritonitis (TP). Clinical features of TP are characterized by sepsis, multiple organ failure, multiple relaparotomies (R), complex medico-surgical care and high mortality rates. Publications on this issue are limited [1, 2].

OBJECTIVES. Our purpose was to analyse clinical and microbiological data of our patients (pts) who underwent multiple R for TP.

METHODS. Between 1999 and 2007, TP observed in a single surgical intensive care unit (ICU) were retrospectively analyzed. The clinical and microbiological evolution according to the number of R and prognosis was assessed. Results are shown by median and interquartile or proportions. Comparison of proportions was made using Chi-2 test ($p < 0.05$ significant).

RESULTS. 109 pts [65 male (60%), age 51 (52–73), IGSII 50 (36–59)] admitted in ICU for community peritonitis (30%) or postoperative peritonitis (70%) developed TP. In 65% of them, at least one severe comorbidity was found. All the pts underwent ≥one R (R1), 55 pts ≥ two R (R2) and 33 pts ≥ three R (R3) for a total of 197 R. At the time of R, the SOFA score was similar from R1 to R3: 7 (5; 12). Persistent signs of infection were the main cause of R from R1 to R3: 76–85% of the pts. An uncontributive R (no clinical evidence of peritoneal infection) was reported 39 times (20%). The microbiological evolution of peritoneal samples from initial surgery to R3 showed increased proportions of non-fermenting Gram-negative bacilli (NF-GNB) (5–24%, $p < 0.01$), unchanged proportions of enterobacteriaceae, staphylococci and candida, and decreased proportions of anaerobes (13–2%, $p < 0.01$). From initial surgery to R3, the proportion of multi-drug resistant bacteria (MRB) increased from 17 to 75% of the isolates ($p < 0.01$). The proportion of inadequate empirical antimicrobial therapy (EA) was stable whatever the number of R (25% in all cases). However, the proportion of adequacy for EA was higher with triple therapy than bitherapy (97 vs. 78%, $p< 0.05$). The clinical improvement of the pts after R (expressed in terms of catecholamine requirements or number of organ failure) was not correlated to the number of R. Mortality in ICU was 45% linked to TP in 95% of the cases without correlation with number of R.

CONCLUSIONS. TP are characterized by severe sepsis with multiple organ failures, a high rate of MRB and a low correlation between evolution and the number of R. The increasing proportion of MRB suggests the prescription of broad spectrum EA with enlarged spectrum with the number of R.

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0743

PROGNOSTIC FACTORS IN PATIENTS WITH INTRA-ABDOMINAL INFECTION AND SEVERE SEPSIS

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INTRODUCTION. Intra-abdominal infections (IAI) may be complicated by organ failure in 20–40% of patients. They are the second cause of severe sepsis and/or septic shock.

OBJECTIVES. To describe clinical and bacteriological features of IAI with severe sepsis and/or septic shock and examine prognostic factors of death.

METHODS. From a data base including 445 patients in severe sepsis and/or septic shock during 2006, patients with IAI (bilary track infection or peritonitis) were studied. Clinical, microbiological and therapeutic characteristics are collected. To isolate predictive factors of death, an univariate analysis was performed followed by a multivariate analysis ($p < 0.05$ is significant).

Results :103 patients were included. Community-acquired infection rate was 63.1% ($n = 65/103$). SAPS II score was 50 (41–58) and number of organ failure was 5 (4–5). The overall mortality rate was 41.8% ($n = 43$).

Bacteriological samples were positive in 82.5% of patients ($n = 85/103$). Isolated microorganisms are shown in Table 1 .

TABLE 1 IAI MICROBIOLOGICAL CHARACTERISTICS

	Community-acquired infections	Nosocomial infections	*p* value
Positive bacteriological samples	55	30	
E.coli	31 (56.4%)	11 (36.7%)	0.06
Enterobacteriaceae	15 (27.3%)	15 (50%)	0.08
Pseudomonas aeruginosa	4 (7.3%)	7 (23.3%)	0.09
Anaerobes	25 (45.5%)	12 (40%)	0.48
Cocci gram positive	26	16	
M. R.S. A.(Methicillin Resistant Staphylococcus Aureus)	2	0	
Enterococci	16 (29.1%)	6 (20%)	0.42
Yeasts	4 (7.3%)	3 (10%)	0.7

The distribution of microorganisms was different in community-acquired and nosocomial infections. Empirical antibiotic therapy targeted the pathogens in 62.4% IAI ($n = 53/85$).

In multivariate analysis, SAPS II at admission was the only predictive mortality factor at day 28.

CONCLUSIONS. In patients with severe sepsis and/or septic shock secondary to IAI, SAPS II at admission is the main predictive factor of mortality at day 28.

0744

UTILITY OF STREM-1 IN DIAGNOSING ETIOLOGY OF ARDS IN PATIENTS WITH ABDOMINAL PATHOLOGY

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Critical patients with abdominal pathologies often develop an acute respiratory distress syndrome (ARDS). On many occasions, we could question if the ARDS is due to the abdominal pathology or caused by a nosocomial pulmonary infection.The soluble triggering receptor expressed on myeloid cells 1 (*sTREM-1*) has already been proved to be useful in diagnosing pulmonary infections.

OBJECTIVE. Our objective is to asses the usefulness of sTREM-1 in the aetiological diagnosis of ARDS in critical patients with abdominal pathology.

METHODS. In patients with abdominal pathology and ARDS, we analysed samples of alveolar lavage and peritoneal fluid. Microbiological and cytological analyses were done, as well as sTREM-1 levels with ELISA method. Clinical and laboratory tests were performed to complete diagnosis. Mann–Whitney *U* test was used to perform statistical analysis.

RESULTS. We included 21 patients in the research. Average age was 48 years (SD 17) and 68% were men. Mean APACHE II score on ICU admission day was 19 points (SD 6) and mean SOFA value on the day of evaluation was 13 points (SD 3).

The most frequent abdominal pathologies were: spontaneous bacterial peritonitis (27%), enteritis (23%) and acute pancreatitis (14%). In 41% of the patients a pulmonary infection was diagnosed, in 27% an abdominal infection was diagnosed, in 27% both infections coexisted.

Mean *alveolar* sTREM-1 level was 1713 pg/ml (1512 pg/ml if an abdominal infection existed and 2,027 pg/ml if there was a pulmonary infection). Mean *peritoneal* sTREM-1 level was 1,424 pg/ml (2,198 pg/ml if an abdominal infection existed and 1,275 pg/ml if there was a pulmonary infection).

To distinguish between the absence and presence of an abdominal infection, the sTREM-1 in peritoneal fluid ($p < 0.001$) and serum procalcitonin (p 0.18) were of utility. To distinguish between the absence and presence of a pulmonary infection, alveolar sTREM-1 (p 0.019) was of utility as well. A ratio alveolar sTREM-1/peritoneal sTREM-1 >1 strongly indicated a pulmonary infection (sensitivity 63%, specificity 100%) whereas a ratio <2 strongly indicated an abdominal infection (sensitivity 89%, specificity 83%).

CONCLUSIONS. In critical patients, the inflammatory response is never only a confined phenomenon, but a systemic one. However, sTREM-1 keeps certain capacity to indicate the infectious origin. Establishing the aetiology of ARDS could have important treatment implications, meanly the indication of surgery if an abdominal infection is diagnosed.

0745

SELECTIVE DECONTAMINATION OF THE DIGESTIVE TRACT (SDD): ADVERSE EFFECTS ON THE GASTRO-INTESTINAL TRACT

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INTRODUCTION. Selective decontamination of the digestive tract (SDD) has been shown to reduce mortality in intensive care patients with an expected duration of ventilation of >48 h. SDD was introduced into our ICU in January 2007. Patients who are expected to be ventilated for >48 h are given liquid colistin, tobramycin, vancomycin and nystatin, to the oral cavity and by gastric tube, in addition to 48 h of intravenous antibiotics. We have previously reported a reduction in acquisition of multi-resistant *Acinetobacter* with SDD. Also, since the introduction of SDD we have noted a rise in the frequency of loose stools which has resulted in delayed discharge from our ICU.

OBJECTIVES. To determine the effect of SDD on the gastro-intestinal tract.

METHODS. Retrospective observational study including all patients admitted and ventilated for more than 48 h during May and June in 2006 (before the introduction of SDD), and in the same periods in 2007 and 2008 (after the introduction of SDD). Patients were identified by search of the ICU database (Acubase) and data obtained by review of bedside charts. The presence of loose stools or three or more stools during a ventilated day was noted. The proportion of days with loose or frequent stools was compared to the total number of ventilated days during each period and these percentages compared by z-test and χ-squared test. The hospital microbiology database was examined to ascertain the frequency of stool testing and any positive results.

RESULTS.

CONCLUSION. The data shows that SDD results in an increase in the number of ventilated days when patients pass loose or frequent stools. The loose stools appear non-infectious in nature. Initially a large number of stool samples were sent to the laboratory but this was reduced by 2008. This data has implications for the safe discharge to the wards of patients who have received SDD. As there are few reported cases of *C difficile* resistance to vancomycin (as contained in our SDD) we would suggest testing for *C difficile* toxin is unnecessary and wasteful unless there is another clinical indicator of infection (Table 1)

TABLE 1 VENTILATED DAYS WITH LOOSE OR FREQUENT STOOLS

	May/June 2006	May/June 2007	May/June 2008
Patients admitted and ventilated >48 h	35	32	39
Patients charts analysed	30	23	31
Total ventilated days	451	248	357
Total "loose stool" days	110	100	147
% ventilated days with loose/ frequent stools	24.4	40.3	41.2
p value z test	–	$p < 0.001$	$p < 0.001$
p value χ squared test	–	$p < 0.001$	$p < 0.001$
Stool samples sent	65	57	33
Positive results	1 (*C diff* toxin)	0	0

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0746

ANALYSIS OF BIOFILM IN EXTERNAL VENTRICULAR DRAINAGE. RELATIONSHIP TO INFECTIOUS COMPLICATIONS. PRELIMINARY RESULTS

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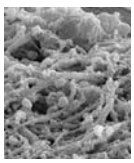
AIMS. Ventriculitis is one of the most feared complications of external ventricular drainage (EVD). It is considered that the formation of a biofilm on the surface of EVD catheters may be related to the pathogeny of ventriculitis. We started this project with the aim of demonstrating the presence of biofilm on EVD of our unit and analysing its relationship to infectious complications.

METHODS. We locate patients with EVD and do cerebrospinal fluid culture of vigilance three times a week. Once the EVD is removed, we divide the catheter into two sections: one is microbiologically cultured and the other one is processed with aldheyde fixation and alcohol dehydratation and examined through scanning electronic microscope. Data are analysed with the statistics program SPSS 15.0.

RESULTS. We have so far analysed 10 EVD. All devices were placed for the treatment of acute hydrocephalus in patients with intracerebral haemorrhage with ventricular involvement and remained, on an average, 9 ± 4 days. We have clinically and microbiologically diagnosed ventriculitis in four patients: three cases from *Acinetobacter baumanii* and one case from *Klebsiella pneumoniae*. We have also found two positive cultures without other diagnostic criteria of ventriculitis: one cerebrospinal fluid culture and one culture of catheter positives for *coagulase-negative Staphylococcus*. We have observed biofilm in all these seven cases and also in another patient without evidence of bacterial presence.

CONCLUSIONS. The presence of biofilm seems to be a relatively common phenomenon on the surface of EVD catheters. It is clearly associated with ventriculitis but the preclinical presence of bacteria may relate to an incipient biofilm formation.



EVD biofilm. A. baumanii ventriculitis

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0747

PERIOPERATIVE INCIDENCE OF NOSOCOMIAL INFECTIONS IN IMMUNOCOMPROMISED HEART TRANSPLANTED PATIENTS ON THE ICU

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BACKGROUND. Nosocomial infections in pharmacologically immunosuppressed patients remain the major cause of morbidity and mortality after heart transplantation (htx). Therefore, we investigated the incidence of infections and changing practice in antibiotic therapy and prophylaxis in htx-patients at our institution over time.

METHODS. We retrospectively analyzed data of 340 heart recipients for perioperative infections and ICU-mortality. Patients underwent htx between January 2000 and December 2008. The Euro-Score and additionally the SAPS II-Score were calculated in each patient. Perioperative sepsis, severe sepsis and septic shock were defined in accordance to international standards. We analyzed the number of patients receiving antimicrobial combination therapy with or without concomitant antimicrobial and/or antiviral medication. The incidence for extracorporeal membrane oxygenation (ECMO) due to acute graft failure was evaluated. ICU-outcome and 30 day mortality were analyzed on an annually basis. Data are given as median if not otherwise stipulated.

RESULTS. Euro-Score significantly increased over the years: 6 (range) in 2000 versus 11 (range) in 2008 ($p = 0.026$), indicating that gradually sicker recipients were accepted for htx. Due to this ECMO support was required in 12.9% of patients in 2000 versus 17.5% in 2008 ($p = 0.043$). The incidence of sepsis and septic shock showed a tendency to increase over the years (11% in 2000 vs. 15% in 2008; [$p = 0.058$]). The administration of a combination (two or more) of broad spectrum antibiotics rose significantly from 2000 (44% of patients, $n = 24/54$) to 2008 (90% of patients, $n = 36/40$) ($p < 0.001$). In 2000, 5 patients (9.3%) required concomitant antimycotic therapy compared with 28 patients (70%) in 2008 ($p < 0.001$). Despite acceptance of severer compromised recipients and increasing need for perioperatives circulatory support with ECMO ICU-mortality decreased over the years (actual ICU-mortality was 12.9% in 2000 vs. 2.5% in 2008). In 2008, none of our heart recipients died within the first 30 days after htx.

CONCLUSION. Our data show that the incidence of infections after htx could not be reduced over the last decade. This is probably at least partially due to acceptance of severer compromised recipients with concomitant complicated surgical course (ECMO and revisions). Antibiotic therapy changed significantly over the years. Early use of a combination of potent broad spectrum antibiotics together with antimycotic therapy was established over 2005. This change in antibiotic therapy seems to be at least one reason for the reduced incidence of sepsis induced ICU-mortality in our immunocompromised heart transplanted patients.

0748

INFECTIONS BY *ENTEROCOCCUS FAECALIS* IN A SICU

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AIM. To evaluate the clinical and microbiological characteristics of patients developing ICU-acquired Enterococcus faecalis infections in our Surgical Intensive Care Unit (SICU).

METHODS. Data for all SICU patients are prospectively collected in our database. Data for cases sustaining ICU-acquired infections by *E.* faecalis from 2001 to 2006 were analyzed.

RESULTS. Among 1,182 hospitalized patients, 262 (22%) had an ICU-acquired infection. Of them, 40 sustained an *E. faecalis* infection (15.3% of the patients with an infection and 3.4% of the total group). Mean age of the patients with an *E. faecalis* infection was 68.8 ± 8.1 years and APACHE II score 19.4 ± 5.3 (female: 57.5%). Patients' diagnoses were acute peritonitis ($n = 12$, 30%), gastrointestinal cancer ($n = 10$, 25%), acute small or large bowel obstruction ($n = 5$, 12.5%), gastrointestinal tract hemorrhage ($n = 3$, 7.5%), acute superior mesentery embolism ($n = 2$, 5%), acute pancreatitis ($n = 2$, 5%), penetrating abdominal trauma ($n = 2$, 5%), acute cholangitis ($n = 2$, 5%), and acute cholecystitis ($n = 2$, 5%). All patients were operated while 30% ($n = 12$) had more than one operations. Twenty-six cases (65%) underwent intestinal surgery, 5 (12.5%) biliary tract operative procedures/cholecystectomy, 4 (10%) esophageal/gastric surgery, 3 (7.5%) hepatectomy, and 2 cases (5%) had pancreatic surgical procedures. Bloodstream ($n = 17$, 42.5%) and surgical site infections ($n = 16$, 40%) were the predominant infection sites. The isolated pathogens presented high resistance to the majority of antibiotics. In particular, high sensitivity was observed only to linezolid (100%), vancomycin (75%), and teicoplanin (75%). Mean SICU and hospital length of stay was 31.5 ± 7.4 and 43.4 ± 8.5 days, respectively. Morbidity and mortality rates were 70 and 45%, respectively. The most common complications were septic shock ($n = 20$, 50%), acute respiratory failure ($n = 18$, 45%), renal ($n = 14$, 35%), cardiac ($n = 11$, 27.5%) and hepatic failure ($n = 9$, 22.5%), coagulopathy ($n = 14$, 35%) and thrombocytopenia ($n = 12$, 30%).

CONCLUSION. ICU-acquired Enterococcus faecalis infections are a significant problem in SICUs due to high correlated multiresistance, morbidity, and mortality. Recognition and analysis of the features of these patients is critical for prevention and treatment of such infections.

0749

INFECTIVE PROBLEMS IN PATIENTS ADMITTED TO ICU. COMPARATIVE ANALYSIS OF INFECTION AS REASON FOR ADMISSION OR AS COMPLICATION DURING ICU STAY

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INTRODUCTION AND AIM. Infection could also be a reason for ICU admission and a complication appeared during ICU stay. It is usually thought that intra ICU infections have a worse survival outcome when compared to those causing ICU admission. Our aim had been to assess this possibility in patients admitted to our IC department.

SETTING. Nineteen beds ICU in a University associated hospital.

PERIOD AND SAMPLE. All consecutive admissions to our ICU since January 2007 to October 2008.

PATIENTS AND METHOD. A total of 1945 patients were considered. In 175 of them an infective problem was the reason for admission and in 135 infections appeared as a complication during ICU stay. Data collected were origin of admission, readmission rate, length of stay (LOS), severity and risk of death (SAPS3) and observed hospital mortality. Attendance variables were the need of ventilatory support (MV), its duration, the need of complex haemodynamic monitoring (HEMO), the need of continuous renal replacement therapy (CRRT), the incidence of ventilation associated pneumonia (VAP) and multiorganic failure (MOF). Statistical significance was studied by SPSS/PC 15.0 and confidence interval analysis (CIA) programs. Signification level was 0.05.

RESULTS. Confirmed infection was present at admission in 172 (medical patients 80%, admitted from hospital wards 51%, LOS 14.3 $\pm$ 14 days, risk of death 46% and mortality rate 37%) and 135 patients during ICU stay (medical 70%, from ward 35%, LOS 27.5 $\pm$ 19.5 days, death risk 46% and mortality rate 36%). MV was needed in 83 versus 91% of the samples, HEMO 44 versus 36%, CRRT 26 versus 22% and MOF 29 versus 25%. ($p < 0.05$ for all comparisons), except for risk of death and observed mortalities.

CONCLUSIONS. In our experience, and with strict infection diagnostic criteria, infection as reason for admission and infection appeared during ICU stay does not have different outcome estimations or mortality outcomes, but the second one is more resources consuming. Any measure addressed to decrease the incidence of intra—ICU infections could be related to a more efficient management.

Fungal infections and novel diagnostic approaches: 0750–0763

0750

EPIDEMIOLOGY AND RISK FACTORS FOR CANDIDEMIA IN NON-NEUTROPENIC CRITICALLY ILL PATIENTS

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OBJECTIVES. To determine the incidence and risk factors for candidemia in the non-neutropenic critically ill patient, and to assess changes in the epidemiology of candidemia over the past decade.

METHODS. Prospective cohort observational and multicenter study divided into two periods: between May 1, 1998 and January 30, 1999, 73 medical-surgical ICUs of 70 Spanish hospitals participated in the EPCAN project (Prevalence Study of CANdidiasis), and between April 1, 2006 and June 30, 2007, the ICUs of 36 hospitals from Spain, France and Argentina participated in the CAVA project (Validation Study of the "*Candida score*" Evaluation System). In both periods, all non-neutropenic critically patients admitted in the ICU for more than 7 days were included. Demographic data, length of stay, severity indexes, comorbidities, and risk factors were recorded. Continuous variables were compared with the Student's *t* test and categorical variables with the chi-square test. All variables with $P \leq 0.1$ in the univariate analysis were included in a stepwise logistic regression model.

RESULTS. Of a total of 2,775 patients recruited in both study periods, 97 cases of candidemia were diagnosed, with an incidence of 33.8 episodes of candidemia per 1,000 patients or 1.5 per 1,000 patients-year. *Candida albicans* was the causative pathogen in 58.3% of cases and non-albicans species in 41.7%. In the multivariate analysis, independent risk factors for candidemia were severe sepsis or septic shock (OR = 3.63, 95% CI 2.18–6.04); multifocal *Candida* spp. colonization (OR = 2.70, 95% CI 1.60–4.56); total parenteral nutrition (OR = 2.35, 95% CI 1.35–4.09), and length of ICU stay (OR = 1.014, 95% CI 1.005–1.023). The crude mortality rate was 59.8% in patients with candidemia and 35.4% in patients without candidemia. There were no statistically significant differences in the incidence of candidemia, distribution of *Candida* spp., length of ICU stay, rate of empirical antifungal treatment, or candidemia-associated crude mortality despite the introduction of new azoles and echinocandins.

CONCLUSIONS. The epidemiology of candidemia in our tertiary hospitals did not change significantly over the past 10 years. Risk factors for candidemia were severe sepsis of septic shock, multifocal colonization, total parenteral nutrition, and ICU length of stay.

0751

RESULTS OF ONE YEAR USE OF CASPOFUNGIN IN INVASIVE CANDIDIASIS

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INTRODUCTION. The echinocandins are a relative new great treatment of invasive candidiasis. Therefore, we must grow our clinical experience and knowledge on its management.

OBJECTIVES.
1. To analyse the appropriate prescription of caspofungin in invasive candidiasis in our Intensive Care Unit (ICU).
2. To determine the hospital mortality and risk of mortality associated with the use of caspofungin in our patients with invasive candidiasis.

METHODS. We collected prospectively the data of all the patients treated with caspofungin during the year 2008 in our medical-surgical ICU for adult non-coronary critically-ill patients, and we reviewed retrospectively Candida spp. isolations, "Candida Score", APACHE II, risk of mortality predicted by the APACHE II, initial SOFA, and maximum SOFA.

RESULTS. There were 387 admissions of patients in our ICU during the year 2008, and we prescribed 23 treatments of caspofungin in 19 patients, because four patients were treated twice during their stay in our ICU. We obtain 14 significant isolations (73.7% of all the patients treated with caspofungin): funguemia: 6, intraabdominal surgical samples: 5, deep surgical incision samples: 2, superficial surgical incision sample: 1. The Candida species isolated were: *C. glabrata*: 6, *C. tropicalis*: 5, *C. albicans*: 3, *C. krusei*: 2 (81.25% of non-albicans species), there were 2 infections with 2 different species of Candida, 17 patients have intrabdominal invasive candidiasis, and only 2 patients were neutropenic with pneumonia.

All the patients had at least a "Candida Score" of 3 points, and their mean value was 4 points.

The mean APACHE II score of these patients was 26.21 points, and their mean hospital mortality risk by APACHE II was 59.12%, the actual hospital mortality was 52.63%.

The mean initial SOFA score was 8.47 points, and the mean maximum SOFA score 12.05 points.

CONCLUSIONS. The prescription of caspofungin was suited in our patients, because all of them had at least 3 points in the "Candida Score", therefore, with a very high probability of invasive candidiasis, that is strengthend with a great proportion of significant Candida isolations (73.7%). Moreover, the very high proportion of Candida non-albicans (81.25%) indicates the empirical use of an antifungal agent other than fluconazol, especially echinocandins. Finally, the hospital mortality of these patients was 5.49% smaller than predicted by the APACHE II, that seems an appropriate outcome.

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0752

CANDIDEMIA DUE TO CANDIDA ALBICANS VS. NON-ALBICANS CANDIDA SPP. IN NON-NEUTROPENIC CRITICALLY ILL PATIENTS. A PROSPECTIVE MULTICENTER COHORT STUDY

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OBJECTIVES. To compare the epidemiology, risk factors, impact of risk factors on mortality and antifungal treatment in non-neutropenic critically ill patients with candidemia due to *Candida albicans* and candidemia due to non-albicans species.

METHODS. Prospective cohort study carried out in 36 medical-surgical ICUs from Spain, France and Argentina. All non-neutropenic critically ill patients admitted between April 2006 and June 2007 for more than 7 days were included. Demographic data, severity indexes, risk factors for candidemia, and antifungal treatment were recorded. Patients were followed until hospital discharge or death. Continuous variables are expressed as mean (standard deviation, SD) or median (25^{th}–75th percentile) and were compared with the Mann–Whitney *U* test or the Kruskal–Wallis test. Categorical variables are expressed as percentages and compared with the chi-square test or the Fisher's exact test. Data were also analyzed in a stepwise logistic regression model.

RESULTS. Thirty-eight cases of candidemia among 1,107 patients recruited were diagnosed (incidence 3.4% or 1.5 per 1,000 patients-year). *Candida* species was unknown in 1 case. In the remaining 37 cases, *C. albicans* was the causative pathogen in 59.5% ($n = 22$) and non-albicans species in 40.5% ($n = 15$), including *C. parapsilosis* (24.3%, $n = 9$), *C. tropicalis* (8.1%, $n = 3$), *C. glabrata* (5.4%, $n = 2$), and *C. krusei* (2.7%, $n = 1$). History of COPD was the only risk factor for *C. albicans* candidemia (OR = 2.15, 95% CI 1.45–3.21). There were no statistically significant differences between candidemias caused by *C. albicans* and non-albicans species regarding demographics, length of ICU stay, severity indexes, *Candida* colonization scores (Pittet, *Candida score*, *Seville score*), and mortality rate (54.5% for *C. albicans* candidemia versus 46.7% for non-albicans species candidemia; in both cases, mortality rates were significantly higher than those predicted by APACHE II and SOFA scores at the time of ICU admission and diagnosis of candidemia). Seven patients were not given antifungals (*C. albicans* 4, non-albicans species 3) and all of them died. In patients treated with antifungals, the median days for starting treatment was 1 (range 0–4) without differences between groups. In all treated cases, the selection of the antifungal agent was appropriate according to the *Candida* spp. isolated.

CONCLUSIONS. Candidemias occurring in ICU patients were caused by *C.albicans* in 59.5% of cases and by non-albicans species in 40.5% (predominantly *C. parapsilosis*). COPD as underlying condition was more frequent in patients with *C. albicans* candidemia. Differences in crude mortality rates between both groups were not found. In patients receiving antifungal agents, treatment was started early and was appropriate to the species.

0753

RISK FACTORS IMPLICATED IN PROVEN FLUCONAZOLE-RESISTANT CANDIDEMIA: PROSPECTIVE ANALYSIS FROM SIX YEARS COLLECTING DATA

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INTRODUCTION. Numerous studies tried to identify risk factors for candidemia caused by non-albicans species or by potentially fluconazole-resistant species (*C. glabrata* and *C. krusei*) with conflicting results, specially whether previous fluconazole (FLU) therapy constitutes an independent risk factor. We hypothesize if the results of these approaches will differ from the analysis evaluating risk factors of microbiologically proven FLU resistant candidemia.

METHOD. Prospective study, including adults patients with candidemia in our hospital, from 2003 to 2008. We analyzed demographic risk factors, underlying diseases, neutropenia, renal insufficiency (RI), transplantation, previous surgery, TPN, APACHE II on the day the positive blood culture was taken, renal replacement therapy and prior treatment with antibiotic and/or antifungals. We attempted to identify implicated risk factors performing these three analyses: (1) *C. albicans* versus *C. non-albicans*, (2) Potentially FLU-resistant species (*C. glabrata* and *C. krusei*) versus FLU-sensitive species and (3) Species with microbiologically confirmed FLU resistance versus species with microbiologically proven FLU sensitivity. The FLU susceptibility determination was made by a commercial colorimetric antifungal test (Sensititre YeastOne) incubated at 35°C and reading the change of colour from blue to red at 24 and 48 h.Statistical analysis: chi-square or Fisher's exact test, Student's *t* or Mann–Whitney *U* test as needed, and multivariate analysis including variables with $p < 0.05$ in the univariate analysis.

RESULTS. 224 candidemia episodes, of which 94 occurred in the ICU. There were 195 (87.1%) isolates of C. FLU-sensitive species (105 *C. albicans*, 39 *C. parapsilosis*, 37 *C. tropicalis*, 11 *C. glabrata*, 3 *C. guillermondii*) and 29 (12.9%) isolates of C. FLU-resistant species (14 *C. krusei*, 15 *C. glabrata*).The first analysis did not show any independent risk factors, the second one showed that prior antibiotic treatment [OR 0.189 (95% IC 0.049–0.733, $p = 0.016$)] and solid organ transplantation [OR 15.37 (95% IC 1.36–173.39, $p = 0.027$)] were independent risk factors for potentially FLU-resistant candidemia. In the third analysis, neutropenia [OR 7.88 (95% IC 2.20–28.20, $p = 0.001$)], RI [OR 3.46 (95% IC 1.24–9.67, $p = 0.018$)] and FLU pre-treatment [OR 4.42 (95% IC 1.47–13.32, $p = 0.008$)] were independent risk factors for microbiologically confirmed FLU-resistant candidemia.In the critically ill patients, the first and second analyses showed not independent risk factors, whereas the last one showed that FLU pre-treatment [OR 7.59 (95% IC 1.35–42.43, $p = 0.021$)] and RI [OR 7.31 (95% IC 1.08–49.41, $p = 0.041$)] were the variables independently associated with microbiologically confirmed FLU resistant candidemia.

CONCLUSION. Prior FLU treatment is an independent risk factor only for candidemia caused by microbiologically confirmed FLU resistant species. These findings may explain the contradictory results found by previous studies.

0754

CANDIDA ALBICANS INFECTIONS IN A SURGICAL INTENSIVE CARE UNIT IN A UNIVERSITY HOSPITAL IN GREECE

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OBJECTIVES. The aim of this study was to identify and evaluate the clinical features of patients sustaining *Candida albicans* infections in our Surgical Intensive Care Unit (SICU).

METHODS. Data for all patients hospitalized in our SICU are prospectively collected in a database. Data for cases developing ICU-acquired infections by *C. albicans* between January 2001 and December 2007 were retrieved and analyzed.

RESULTS. Among 1,255 hospitalized patients, 287 (22.8%) had an infection. Fifty-nine cases developed an ICU-acquired C. albicans infection during their SICU stay and composed our study group (20.5% of the cases with an infection and 4.7% of the total group of patients). Mean age of these patients was 66.2 ± 6.5 years and APACHE II score 21.6 ± 5.2 (men: $n = 32$, 54.2%). The most frequent underlying surgical pathology (hospital admission diagnosis) was gastrointestinal cancer ($n = 23$, 39%), mechanical small or large bowel obstruction ($n = 11$, 18.7%), acute peritonitis ($n = 11$, 18.7%) and pancreatitis ($n = 6$, 10.2%). The majority of the patients was operatively treated ($n = 54$, 91.5%); 30 (50.8%) underwent intestinal surgery, 7 (11.8%) biliary tract operations, 6 (10.2%) esophageal/gastric surgery, 6 (10.2%) hepatectomy, and 5 cases (8.5%) had pancreatic surgical procedures. Urinary tract, surgical site, bloodstream and respiratory tract infections constituted the most common infection sites. Complication rate of these patients was 76.2% ($n = 45$); septic shock was the most frequent complication ($n = 35$, 59.3%) followed by acute respiratory failure ($n = 30$, 50.8%), renal ($n = 28$, 47.4%), cardiac ($n = 20$, 34%) and hepatic failure ($n = 18$, 30.5%). Mortality was 50.8% ($n = 30$). Mean SICU and hospital stay was 29.5 ± 7.4 and 41.7 ± 8.3 days, respectively.

CONCLUSIONS. Candida albicans infections are frequent in SICUs. Identification and analysis of the characteristics of the patients developing these infections is important for their prevention and treatment.

0755

EPIDEMIOLOGY, MANAGEMENT AND RISK FACTORS OF CANDIDEMIA IN CRITICAL CARE

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INTRODUCTION. Candidemia is frequently encountered in the nosocomial setting and often fatal for critically ill patients. We retrospectively studied the epidemiology, management and risk factors of candidemia, in a polyvalent intensive care unit of a tertiary care hospital.

PATIENTS AND METHODS. Between October 2006 and March 2009 all adult patients with candidemia, proven during their hospitalization in our 18-bed ICU, were included.

RESULTS. During the study period, 33 patients with isolated candidemia (6.28% of the total number of hospitalized ICU patients) were included. Eight of them (24%) had received antifungal prophylaxis. In 48% of the cases, candidemia occurred within the first 10 days after ICU admission, whereas the mean time (±SD) elapsed between ICU admission and candidemia onset was 24 ± 26 days. C. albicans remained the most frequently isolated species, accounted for 51.5% of the isolates, followed by *C.glabrata* (18%), *C.parapsilosis* (15%), *C. krusei* (9%) and *C.tropicalis* (6%). Caspofungin was the most commonly introduced treatment (66%), followed by liposomal amphotericin B (21%), fluconazole (6%), voriconazole (3%) and anidulafungin (3%). The mean (±SD) therapy duration was 20 ± 13 days, while treatment regimen was modified in 24% of patients. Isolates were eradicated in 19 patients (57%) and the mean (±SD) time of sterilization of cultures was 10 ± 5 days after treatment introduction. However, signs and symptoms of candidemia were eliminated in 13 patients (39%). The attributable to candidemia mortality rate was 45%, while the all-cause mortality rate was 70%. Regarding the most frequently reported conditions predisposing to candidemia: an indwelling vascular catheter was present in all patients, while 94% of them had received broad spectrum antibiotics, during the last 10 days before candidemia onset. In 8 (24%) of the cases, a prior surgery had occurred, while in 5 (15%) of them an abdominal surgery was present. 10 patients (30%) received total parenteral nutrition, 12 (36%) were in continuous renal replacement therapy, 9 (27%) were under corticosteroid therapy and 4 (12%) received immunosuppressive drugs. Diabetes mellitus was present in 6 (18%) patients, a malignancy in 5 (15%) and severe sepsis in 21 (63%) patients. All patients were mechanically ventilated. Ostrosky prediction rule was positive in 18 patients (54%), while Candida colonization was observed in 5 (15%) of patients.

CONCLUSIONS. Candidemia is a growing concern in the ICU, as it is associated with a high mortality rate. *C.albicans* remains the most commonly isolated species.

0756

IMPACT OF ANTIFUNGAL AGENTS ON OUTCOMES IN NON IMMUNOCOMPROMIZED ICU PATIENTS: A CASE CONTROL STUDY

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INTRODUCTION. Patients with ICU-acquired sepsis benefit from early and adequate antibacterial agents. The adjunction of antifungal agents (AFA) remains controversial.

METHODS. Among the 7,219 patients included the Outcomerea database between 1996 and 2007, AFA were prescribed in 640 (8.8%) patients, including 334 nonimmunocompromized patients mechanically ventilated for more than 2 days.

RESULTS. Patients receiving AFA (AFA+) were medical in half the cases, admitted for peritonitis in 17.5% of the cases and had a SOFA score day 1 at 7 (4–9) and a SOFA score at 5 (3–9) on treatment implementation day. AFA were prescribed at day 15 (5–21) and for 7 (3–10) days. AFA administration was for curative purpose in 26 (10%) patients (23 candidemia and 3 peritonitis), and fluconazole was the most frequently prescribed drug (57%).

260 patients AFA+ were paired with 262 AFA− patients (on year of ICU admission, center, medical versus surgical patients, presence of central line at day 1, TPN, risk of death ±10% and time in the ICU before AFA prescription. Overall, AFA+ patients had increased hospital mortality compared to paired controls (43 vs. 31%, OR 1.74 (1.18–2.59), $p = 0.005$).

AFA+ patients required more frequently life sustaining therapy and for a longer duration. Accordingly, their ICU stay was longer [25 (9–31) vs. 21 (8–28) h, $p = 0.01$]. After AFA administration, AFA+ patients were at higher risk for carriage of multi-resistant bacteria (21.2 vs. 5%, $p < 0.0001$) and presented more frequently an episode of VAP than AFA− patients (10 vs. 5.3%, $p = 0.05$).

Among the 522 exposed and unexposed patients, information regarding Candida colonisation was available in 384 (73.6%) patients, including 180 (46.9%) patients colonized in at least one site (68 patients with multiple colonization). Candida albicans accounted for only half the identified species. AFA+ patients had higher colonization index and Candida score than AFA- patients (CI 0.32 vs. 0.14, $p < 0.0001$ and Candida score at 2 (1–3) vs. 3 (2–4), $p < 0.0001$). After adjustments on Candida colonization, mortality in AFA+ patients was no longer different than these from AFA- patients [OR 1.24 (0.67–2.31), $p = 0.50$]. Adjustments made on Candida score or colonization index provided similar results. Strikingly, in patients in whom Candida colonization follow-up was available, AFA+ patients were at higher risk of loosing their colonization than AFA- patients (20.3 vs. 10.2%, $p = 0.006$).

CONCLUSION. AFA are prescribed in up to 9% of critically ill patient. In 90% of the cases, treatment's indications are prophylaxis or pre-emptive therapy. Patients receiving AFA are sickest, with more frequently unresolved acute diseases requiring heavier and longer organ support, and with higher hospital mortality. By showing that AFA succeed to decrease mortality of AFA+ patients to the level of this from AFA− patients, this study suggests benefit from AFA and depicts the framework of an interventional study.

0757

DETECTION OF BACTERIAL AND FUNGAL PATHOGENS ASSOCIATED WITH SEPSIS IN PATIENTS PRESENTING TO THE EMERGENCY ROOM

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Morbidity and mortality from community-acquired sepsis continues to be a major health care burden. Blood culture remains the gold standard to identify bloodstream infection despite its low sensitivity and prolonged incubation time. In this study, we sought to establish the clinical utility of pathogen DNA detection in blood by multiplex PCR as compared to and in conjunction with conventional blood culture.in patients presenting to the emergency department.

We enrolled patients with suspected infection and at least two Systemic Inflammatory Response Syndrome (SIRS) criteria presenting to the emergency department at Duke University Medical Center and the Durham VA Medical Center. We obtained blood cultures from all patients and performed multiplex PCR using the Light Cycler SeptiFAST test on concurrent whole blood. After review of patient records, an infectious diseases clinician categorized patients according to likelihood of infection.

Of 290 patients enrolled, we identified 206 (71%) patients with confirmed or likely infection and 84 (29%) with no identified infectious etiology. The most common sites of infection were urinary tract (45), lung (37) and skin (34) accounting for 69% of all identified sites. *Staphylococcus aureus* and *Escherichia coli* accounted for 58.6% of causative organisms. Patients with definite infection had higher rates of positive blood cultures (31 vs. 0% in those without infection) and positive PCR (24 vs. 2% in those without infection). Patients with definite infection also had increased IL-6, PCT and CRP levels compared to patients without infection. Of 39 subjects with concordant positive results, blood culture and multiplex PCR identified the same etiologic agent in 37 cases. Including polymicrobial isolates, blood culture and PCR each identified a total of 63 organisms on the list of PCR-detectable organisms. Excluding contaminants, blood culture demonstrated a sensitivity, specificity, PPV, and NPV of 31, 100, 100, and 37%, respectively, whereas the same test characteristics for multiplex PCR were 24, 98, 96 and 34%. Combining the results of PCR with blood culture improved sensitivity to 36% without a change in specificity. Multiplex PCR detected polymicrobial infections more often than blood culture.

Detection of pathogen DNA by multiplex PCR is highly correlated with signs and symptoms of sepsis. The combination of blood culture and multiplex PCR enhances the performance of microbiological techniques for the detection of bloodstream infection.

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CHARACTERIZATION OF SEVERE *PLASMODIUM FALCIPARUM* MALARIA PATIENTS IN AN ANGOLAN GENERAL ICU: A THREE YEARS REVIEW

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INTRODUCTION. Malaria is the most important human parasitic disease, causing an estimated 500 million clinical cases and more than 1 million deaths annually. *Plasmodium falciparum* is responsible for the most serious form of the disease, with a significant mortality rate in the absence of prompt recognition and urgent appropriate patient management.

OBJECTIVE. To characterize severe *Plasmodium falciparum* malaria patterns in patients admitted to an Angolan general ICU.

METHODS. A retrospective study based on medical records of adult patients with severe *Plasmodium falciparum* malaria admitted between January 2006 and December 2008 at the general ICU of Clínica Sagrada Esperança, an Angolan University-affiliated teaching hospital. We collected data on demographics, malaria-related immunity status, clinical presentation, WHO malaria severity criteria, laboratory findings and outcome. Continuous data were analyzed with Students *t*-test. A P of less than 0.05 was regarded to be significant.

RESULTS. Out of 114 patients admitted with diagnosis of malaria in the study period, we enrolled 56 patients. Forty-four (79%) were males. The mean age was 43.0 ± 12.9. Twenty-eight (50%) were non-immune and only two were adherent to chemoprophylaxis, but reported taking it incorrectly. Fifty-two percent were admitted during the second trimester. The mean APACHE II was 15.4 ± 8.7 with a mean predicted dead rate of 25.9%. The mean SOFA on admission was 7.6 ± 3.6. Fever (82%) followed by headache (41%) and gastrointestinal symptoms (36%) were the most common symptoms on admission and jaundice (61%) the most common sign. The mean duration of symptoms prior to presentation at the ED was 6.1 ± 4.3 days. Malaria diagnosis was confirmed within 24 h of admission to our hospital in all the cases. Twelve patients presented two or more WHO severity major criteria. Forty-one patients were treated with quinine and twelve with artemether. Nineteen patients (34%) required ventilatory support, 20 (36%) intermittent hemodialysis and 12 (21%) vasopressor support. The mean ICU length of stay was 5.5 ± 3.8 days. The 2-day mortality rate and total ICU mortality rate recorded was 10.7 and 37.5%, respectively.

CONCLUSIONS. In this review, the criteria usually pointed as predictors of a poor outcome on sepsis cases were found to have statistical significance in malaria-related deaths (Table 1)

TABLE 1 CHARACTERISTICS OF SURVIVAL AND NONSURVIVAL GROUPS

	Survival ($n = 35$)	Non-survival ($n = 21$)	P
Age, Mean ± SD	43.7 ± 12.5	42.0 ± 14.0	**0.66**
APACHE II, Mean ± SD	**12.1 ± 6.2**	21.0+9.4	<0.0001
SOFA on admission (total), Mean ± SD	**6.5 ± 3.3**	9.6 ± 3.5	0.0013
Non-Immure, *n* (%)	18(51.4)	10(47.6)	0.79
Two or more WHO severity criteria, *n*(%)	**1 (0.3)**	**11 (52.41)**	< 0.0001
Platelets ($X10^3/mm^3$), Mean ± SD	85.5 ± 86.3	65.3 ± 57.3	0.35
Bilirubin (mg/dl), Mean ± SD	4.8 ± 4.7	6.9 ± 7.2	0.08
Creatinine (mg/dl), Mean ± SD	3.6 ± 3.15	3.9 ± 2.6	0.67
C-reactive protein (mg/l), Mean ± SD	118.0 ± 87.5	140.0 ± 103.0	0.45
Arterial lactates (mmol/l), Mean ± SD	**3.4** ± 2.89	**5.4 ± 4.6**	0.019
Parasitemia ($X10^3$parasites/mm^3). Mean ± SD	30.5 ± 28.8	27.8 ± 36.7	0.73

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0759

LIGHTCYCLER SEPTIFAST® AS A TOOL TO ENHANCE THE DETECTION OF BACTEREMIA AND FUNGEMIA IN PATIENTS WITH INTRAABDOMINAL INFECTION DURING ANTIMICROBIOLOGICAL THERAPY

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Inadequate antimicrobiological treatment was reported to be the most important determinant of outcome in septic patients. The classic gold standard to detect bacteremia in septic patients is the blood culture (BC). Up to two-third of severe sepsis cases are BC negative, especially when the patient already received empirical antimicrobiologial therapy.

The aim of our preliminary study was to determine the additional diagnostic value of the LightCycler SeptiFast® M^{Grade} test (Roche Diagnostics) in the blood of patients with complicated intraabdominal infection (cIAI) during empirical antimicrobiological therapy. The SeptiFast test is a multiplex PCR test that can detect nucleic acids from the most common pathogens (approximately 90%) responsible for hospital-associated bacteremia and takes 6–7 h to perform.

The study enrolled 18 patients with severe sepsis and cIAI during empirical antimicrobiological therapy. BC and blood for the SeptiFast were taken at the same time point. The patients received at least one full dose of empirical antibiotic therapy at this time point.

BC were negative is 13 cases, in 3 cases positive and 2 were classified as contamination. SeptiFast were positive in 10 cases, in 7 cases negative and 1 was classified as contamination. Eight BC negative samples revealed relevant pathogens by the SeptiFast test. Five negative BC were also negative in the SeptiFast test. Two tests pairs were identical in BC and SeptiFast, including one contamination. One BC found a multiresistent Staph. aureus not identified by the SeptiFast test. One BC showed Candida glabrata whereas polymicrobiological results were identified by the SeptiFast test.

The BC negative and SeptiFast positive pathogens were: Enterococcus faecium, E. coli, Pseudomonas aeroginosa and Candida albicans. In five of these cases antimicrobiological therapy were adjusted.

Multiplex PCR (SeptiFast) detected potentially significant bacteria and fungi that were not found by BC in patients with severe sepsis during antimicrobiological therapy. The SeptiFast test may serve as a tool to detect relevant blood stream pathogens under antimicrobiological therapy.

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LIGHTCYCLER SEPTIFAST AND VCS: RELATIONSHIP BETWEEN TWO INNOVATIVE INSTRUMENTS IN SEVERE SEPSIS AND SEPTIC SHOCK

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INTRODUCTION. Neutrophil count is normally used as diagnostic tool of bacterial infections, but it is not specific and accurate. Many authors have analyzed the clinical usefulness of VCS parameters: channels of cell volume (V), conductivity (C), and light scatter (S) in reactive neutrophils to find relationship between these data and infections. In a recent study a significative increase of mean of cell volume and an important decrease in mean of light scatter in adult septic patients are described; they could have a remarkable role also in patients non presenting leucocytosis or neutrophilia. The aim of this study is to compare retrospectively the results of LightCycler Septifast, as sepsis diagnostic instrument, and VCS values by Coulter LH750, in critical adult patients with severe sepsis and/or septic shock and presenting neutrophilia (>12.000).

MATERIALS AND METHODS. Actually we enrolled 24 patients with severe sepsis and septic shock (ACCP/SCCM) and neutrophilia and collected 38 blood sample. Two groups were created: group S+ (20) with positive PCR results and Group S− (18) with negative PCR results. All the blood samples were analyzed with Coulter LH750 for VCS values.

RESULTS. Results are shown in Table 1.

TABLE 1 VCS IN GROUP S+ AND GROUP S-

	Group S+	Group S-
SD V	13.41	18.49
MV	169.33	170.91
SD C	2.64	1.58
MC	141.33	140.83
SD S	8.25	7
MS	133.16	134.5

In our two group of patients there are not significative difference of V, C, S values between Group S+ and Group S-

DISCUSSION. The diagnosis of sepsis is normally based on microbiological culture. Other procedures as PCR system (as Septifast), value of RCP, microscopic analysis of peripheral blood sample could be useful. Slide of peripheral blood requires a lot of time and depends on human capacity and ability, but the VCS parameter obtained by Coulter LH750 requires only few minutes. In our study, we investigated if there is an added value of V, C, S, in diagnosis of sepsis.

CONCLUSION. We obtained similar results in both groups of patients (S+ and S−) and we concluded there is not relationship between sepsis showed by Septifast and VCS parameters, and the use of VCS does not seem to be useful in diagnosis of sepsis.

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PCR, SCREENING OF NOSE AND PERINEUM VERSUS EXTENDED CULTURE BASED SCREENING FOR MRSA IN INTENSIVE CARE PATIENTS

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BACKGROUND. Colonisation and infections with Methicillin-resistant *Staphylococcus aureus* (MRSA) are a major problem worldwide. Nares, mouth, arm pits, groins and chronic wounds are typical sites for MRSA colonisation. Furthermore, colonisation of gut, lung and vagina are reported, too. Early detection of a MRSA—colonisation by screening has been shown to significantly improve infection control and prevent further spread of resistant strains. Especially intensive care patients transferred between hospitals are often screened and isolated preemtively to minimise cross-colonisation between units. Polymerase-chain-reaction (PCR) based assays are faster than cultural tests, but are more costly and currently not validated for all sites. Therefore, complete screening of all possible colonisation sites with PCR-based methods is impossible. On the other hand, PCR based assays would allow to stop isolation precautions sooner and make earlier rehabilitation possible.

METHODS. We assessed, whether a PCR—screening of nares and perineum is equal to a conventional, culture-based screening of all possible colonisation sites. From August 2007 to February 2008, intensive care patients transferred from the ICU of the University Hospital Greifswald to the early neurological rehabilitation unit of the BDH-Hospital Greifswald (the priority centre for treatment of severe cranium and brain damage in Mecklenburg—Pommerania, Germany) were screened for MRSA before and after transfer by PCR (nares, perineum) and by culture (head, nares, mouth, arm pits, groins, chronic wound and catheter insertion sites), respectively.

RESULTS. No patient tested negative for MRSA in the PCR became positive in the culture. PCR results were available within 8 h, while conventional tests took at least 48 h. Using PCR-based screening saved 2 days of isolation. Higher costs for the test itself are more than out weighted by earlier stop of isolation precautions. PCR-based screening has now proven to be secure and cost efficient for this setting in everyday practice.

0762

VALUE OF LIGHTCYCLER SEPTIFAST® IN DETECTION OF VENTILATOR-ASSOCIATED PNEUMONIA

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Ventilator-associated pneumonia (VAP) is an important cause of morbidity and mortality in ICU patients. Delayed diagnosis and subsequent delay in initiating appropriate therapy may be associated with worse outcome [1]. Several diagnosis criteria have been proposed for the diagnosis of VAP, nonetheless an acceptable gold standard does not exist. Blood cultures are relative insensitive in the diagnosis of VAP.

We want to report results from patients with suspected VAP and the value of the LightCycler SeptiFast® M^{Grade} test (Roche Diagnostics) in comparison with BC and tracheal aspirates. The SeptiFast test is a multiplex PCR test that can detect nucleic acids from the most common pathogens (approximately 90%) responsible for hospital-associated bacteremia.

In the study 32 patients with suspected VAP (CPIS Score >5, [2]) were enrolled. Collection of tracheal aspirates and blood for BC and SeptiFast were taken at the day of clinical diagnosis of VAP.

SeptiFast tests were positive in 13 cases. *S. aureus* was the dominant pathogen in 6 cases. BC were positive only in 4 cases, including 2 cases of *S. aureus* bacteremia also displayed by the SeptiFast test. Two positive BC were not displayed in the SeptiFast test, one of them were assessed as contamination. Tracheal aspirates revealed in 22 cases growth of bacteria and funghi. Predominantly Candida albicans was found in 10 cases, assessed as colonisation not treated with an antifungal therapy. In six cases results from tracheal aspirates were assessed as relevant pathogen not displayed in the SeptiFast results.

The SeptiFast test is more sensitive in the detection of relevant blood pathogens in VAP than the BC. The multiplex PCR may help in the discrepancy between bacteremia associated with VAP and colonisation of tracheal aspirates.

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0763

CLINICAL APPLICATION OF DIFFERENTIAL TIME TO POSITIVITY OF BLOOD CULTURES AS A DIAGNOSTIC METHOD FOR CATHETER-RELATED BLOODSTREAM INFECTION

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INTRODUCTION. Clinical suspicion of catheter-related bloodstream infection (CR-BSI) requires, in many cases, the catheter withdrawal. Definitive diagnosis is confirmed only in 15–25% of the withdrawn catheter. Differential time to positivity (DTP) of blood cultures has been validated by or group [1] and others as an accurate diagnostic method of CR-BSI avoiding unnecessary catheter withdrawal.

OBJECTIVE. To prove the safety and the useful of DTP in comparison with a standard method that needs catheter removal.

METHOD. We performed a prospective and randomized study in a medical-surgical ICU during a 20 month period (July 2007–February 2009). Patients admitted in the ICU requiring a central venous device were included. At the moment of CR-BSI suspicion, excluding those with hemodynamic instability, patients were randomly assigned to a diagnostic method. Group 1: standard [2]. Group 2: DTP, 2 peripheral vein blood cultures and a catheter hub blood culture were simultaneously carried out. Times to positivity of all the blood cultures were automatically registered (BacT/ALERT; Organon Teknica). The diagnosis of CR-BSI was considerate when all the cultures were positive for the same micro-organism and DTP $\geq$ 120 min. We compared clinical and microbiological data, rates of CR-BSI and management of catheter between two groups using χ^2 and Student's t test.

RESULTS. 133 patients were included. 52 patients with suspicion of CR-BSI were randomized (77% males, 59 years $\pm$ 19, APACHE II 22 $\pm$ 10) with no difference between both groups. While CR-BSI and colonization rates were not different between groups, DTP allowed to maintain an important number of catheters (Table 1)

TABLE 1 RESULTS

	STANDARD	DTP	*P*-value
PACIENTS	26	26	
EPISODES OF CR-BSI SUSPICION	37	26	
CR-BSI	5	4	0.87
COLONIZATION	5	3	0.78
CATHETERS RELATED TO CR-BSI	17	13	0.88
MAINTAINED CATHETERS	0	30	<0.001
COMPLICATIONS	0	0	

There was no difference in the evolution of inflammatory parameters: ΔCRP (0.4 $\pm$ 6 vs. 0.8 $\pm$ 3; $p = 0.86$), Δleukocytoses (1,405 $\pm$ 2,105 vs. 1,201 $\pm$ 2,090; $p = 0.94$), Δtemperature (0.33 $\pm$ 0.8 vs.0.84 $\pm$ 0.7; $p = 0.27$) during the 24 h following the suspicion of CR-BSI between the two methods. The micro-organisms who caused CR-BSI were *S. epidermidis* (4 cases), *S. aureus* (1), MRSA (1), *Pseudomonas aeruginosa* (2), *Enterobacter cloacae* (1).

CONCLUSION. A diagnostic strategy of CR-BSI by DTP method allows unnecessary catheter withdrawal. However, we did not found increase in morbidity due to new catheter insertion. Delay in the catheter removal in cases of CR-BSI does not involved increase in morbidity.

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Multiresistant infections: 0764–0777

0764

A LARGE OUTBREAK OF KPC-PRODUCING KLEBSIELLA PNEUMONIAE AND EFFORTS TO CONTROL IT

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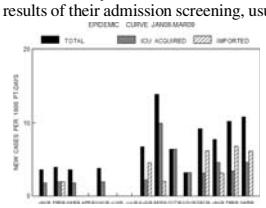
AIMS. *Klebsiella pneumoniae* Carbapenemase (KPC)-producing *Klebsiellae pneumoniae* (*Kp*) have been reported from around the world, especially the US and Israel. We describe an outbreak of KPC-*Kp* that occurred in our ICU and the efforts to control it.

METHODS. The study was performed in a 21-bed ICU in a teaching hospital. The nurse-to-patient ratio is 1-to-3 during all shifts. ICU patients are routinely screened on admission, then rectally once and tracheally twice weekly. The outbreak was first noticed in late September 2008. Screening for KPC-production was introduced by boronic acid disk test and the epidemic was prospectively followed. Furthermore, all *Kp* strains isolated during 2007 and 2008 were retrospectively submitted to boronic acid disk testing and to PCR for a KPC gene. All patients found to be colonized or infected with KPC-*Kp* from January 2007 to March 2009 were included in the study. On detection of the epidemic, several staff meetings were arranged to communicate the problem and encourage hand hygiene and contact precautions. On December 2008 cohorting of colonized or infected patients began. Cohorted patients were limited to two of the four ICU wards. Weekly efforts were made for dedicating nursing staff to KPC patients only, although this was not always affordable due to nurse unavailability. New admissions were not quarantined and their final disposition depended on the results of their admission screening, usually reported 3–4 days later.



EPIDEMIC CURVE

RESULTS. From August 2007 to March 2009, KPC-*pK* was isolated from 53 patients. Mean age was 68 years, with 25 cases being male and mean admission APACHE II 19. Forty-six of them were mechanically ventilated, 12 had renal failure, 7 were immunosuppressed and 12 had recent surgery. Crude ICU mortality was 53%. KPC-*pK* was imported in 20 cases and ICU-acquired in 27. Thirteen patients (25%) were infected (9 BSI, 3 VAP, 1 SSI). Infections were treated with a varying combination of colistin, tigecycline and/or gentamycin. All BSIs had a favorable outcome. One VAP and the SSI showed no improvement but the patients died of other causes. Overall, in no case was the KPC-*pK* infection considered the cause of death.

CONCLUSIONS. The outbreak seems to be getting into an endemic status. Although transmission in the ICU seems to be more or less controlled, increased admissions of unidentified carriers, detection delays until cohorting and low nurse-to-patient ratios seem to be major obstacles to outbreak control.

0765

RISK FACTORS FOR ISOLATION OF THIRD GENERATION CEPHALOSPORIN RESISTANT ESCHERICHIA COLI OR KLEBSIELLA PNEUMONIAE IN INTENSIVE CARE

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INTRODUCTION. Antibiotic resistant infections are a major problem in intensive care. Identifying potential risk factors for this could help with prioritising interventions. Previous research on this issue has had inconsistent results.

OBJECTIVES. To identify risk factors for the isolation of third generation cephalosporin (3GC) resistant Escherichia coli or *Klebsiella pneumoniae* from patients in the Intensive Care Unit of a large teaching hospital.

METHODS. Isolates were from any clinical specimen, and were not differentiated as infection/colonisation. Case group 1 had had 3GC sensitive *E. coli* or *K. pneumoniae* isolated from them. Case group 2 had had 3GC resistant *E. coli* or *K. pneumoniae* isolated from them. Controls did not have E. coli or K. pneumoniae isolated from them. Factors analysed were unit length of stay (LOS), Apache II score, age, total days of 3GCs (cefotaxime, ceftazidime and ceftriaxone), and total days of 'other antibiotics' (ciprofloxacin, gentamicin and tazocin). A Colonisation Pressure Index (CPI) was developed that aimed to indicate the potential risk of cross infection on the unit. The data used was available from unit and hospital audit data, and was analysed using logistic regression. Initially a single control group was randomly selected from all eligible admissions (case-case-control methodology, Kaye et al. 2005). The data was then reanalysed using controls matched for length of stay for each case group.

RESULTS. Between April 2007 and March 2008 there were 552 eligible admissions. 30 patients were identified with 3GC sensitive isolates, 11 with 3GC resistant isolates (all 11 of these produced at least one beta-lactamase, only one did not produce an ESBL). With randomly selected controls the CPI was a significant risk factor for isolation of sensitive bacteria (OR 1.127). There was a significant correlation between the CPI and unit LOS ($rs = 0.443$, $p = 0.000$). Length of stay and age were significant risk factors for isolation of resistant bacteria (OR 1.195 and 0.932, respectively). With controls matched for length of stay 3GC use had a protective effect for isolation of sensitive bacteria (OR 0.318). No significant risk factors were found for isolation of resistant bacteria.

CONCLUSION. When length of stay was controlled for, cross infection was not a significant risk factor for isolation of *E. coli* or *K. pneumoniae*. A protective effect of 3GCs against the subsequent isolation of 3GC sensitive E. coli or K. pneumoniae was found. This may have implications at the population level (Lipsitch and Samore, 2002).

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0766

PREDICTORS FOR BLOODSTREAM INFECTIONS AMONG ICU PATIENTS CAUSED BY CARBAPENEM-RESISTANT KLEBSIELLA PNEUMONIAE ISOLATES PRODUCING DIFFERENT CARBAPENEMASES AND EFFECT OF ACQUISITION ON MORTALITY. A PROSPECTIVE OBSERVATIONAL STUDY

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INTRODUCTION. Carbapenem resistance of Klebsiella pneumoniae (KP) in our hospital has increased from 1.75% in 2005 to 37% in 2008.

OBJECTIVES. The aim of our study was the evaluation of molecular epidemiology, risk factors, treatment and outcome of patients with bloodstream infections (BSI) due to KP in the ICU of a 1,200-bed tertiary Greek hospital.

METHODS. We prospectively studied all patients with BSI due to KP in our ICU from 1/1/2007 to 1/1/2009 and we divided them in three groups: Patients with BSI due to carbapenem-susceptible KP (control group), patients with BSI due to VIM-type producing KP (VIM group) and patients with BSI due to KPC-type producing KP (KPC group). Risk factors, treatment and outcome of VIM and KPC group were compared with the control group in order to identify risk factors and mortality rates of BSI due to VIM or KPC producing KP.

RESULTS. A total of 59 patients were included in the analysis, 22 in control group (37.2%, 17 male, age 49 ± 18.6 years, admission APACHE II score 19 ± 6.9 and SOFA score on the first day of infection 10.8 ± 3.2), 18 in VIM group (30.6%, 13 male, age 56 ± 17.4 years, APACHE II score 20 ± 7 and SOFA score 10.8 ± 3.5) and 19 in KPC group (32.2%, 15 male, age 48.6 ± 15 years, APACHE II score 24.5 ± 6.8 and SOFA score 11.8 ± 4.8). BSI occurred 12 (range 5–37) days after admission in control, 13 (range 7–36) days in VIM and 18 (range 6–30) days in KPC group. The patients' ICU LOS was 25 (range 13–90) days in control, 26 (range 12–60) days in VIM and 28 (range 8–51) days in KPC group. VIM group isolates were susceptible to gentamycin (100%) and colistin (100%). KPC group isolates were susceptible to gentamycin (80%) and colistin (100%). All patients in control and VIM group and 18/19 (94.7%) in KPC group received appropriate empiric therapy. Age, gender, APACHE II and SOFA score, recent organ transplantation and any kind of prior antibiotic therapy did not affect the prevalence of BSI due to VIM or KPC producing KP ($p > 0.05$). The ICU mortality rates were 41% for the control group, 44% for the VIM and 63% for the KPC group.

CONCLUSIONS. The emergence of carbapenem resistance of KP has important implications to the future ability to treat these infections meaning that patients with BSI due to KPC producing KP are more likely to die. No specific predictors may discriminate the prevalence of this kind of infection.

0767

THROMBOCYTOSIS IN RESPIRATORY TRACT INFECTIONS CAUSED BY ACINETOBACTER

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INTRODUCTION. In recent years we have been noting that Acinetobacter infections are often accompanied by thrombocytosis. We have not found any reference in medical publications before.

MATERIAL AND METHODS. Case-control study of patients admitted in ICU who developed an acinetobacter infection since October 2007 to December 2008. For the control group we used a random group of patients for any reason, who developed infections for any other microorganisms and were admitted in the same period of time.

We analyzed clinical and demographic data y both groups. Presence of thrombocytosis (>400.000 µ/mL) and clinical types of infections (respiratory, bloodstream, urinary or central nerve system) were studied.

Qualitative variables are expressed as percentage and absolute value, while mean and standard deviation are provided for quantitative variables.

RESULTS. We analyzed 66 patients in the acinetobacter group and 61 in control group. Mean age was 50.24 ± 17.51 years for acinetobacter group and 54.77 ± 18.34 years in control group. We did not find differences in previous clinical data in both groups, except increased male sex in acinetobacter group (74.2% vs. 57.37%, $p = 0.045$).

We detected higher percentage of patients in the group of acinetobacter than in control group ($p = 0.0001$). After analyzed clinical forms of infections, only respiratory tract infections by acinetobacter were related with thrombocytosis ($p = 0.014$). In the group of acinetobacter infectios, the presence of thrombocytosis were associated with lower rate of mortality ($p = 0.036$).

CONCLUSIONS. In our patients, the presence of thrombocytosis was associated with respiratory tract infections by acinetobacter, and with less severe forms of infections, with lower rate of mortality in this sub-group of patients.

0768

CLINICAL AND MICROBIOLOGICAL PROFILE OF PATIENTS INFECTED WITH ACINETOBACTER IN ICU

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INTRODUCTION. We aim to describe what kind of patients actually develops an Acinetobacter infection and how far since admission in ICU the infection develops. We have also analysed the antibiotic resistance profile and the antibiotic treatment used.

MATERIAL AND METHODS. This is a prospective-retrospective observational study of patients admitted in ICU, with at least, one positive culture for Acinetobacter.

We collected clinical and demographic data. We analysed previous infections and germs during admission and length of stay in ICU. We also reviewed the resistance profile of acinetobacter and the treatment used.

Qualitative variables are expressed as percentage and absolute value, while mean and standard deviation are provided for quantitative variables (except for skewed variables, for which median and interquartile range are used).

RESULTS. 91 clinical histories for patients with documented infection by Acinetobacter have been collected from September 2007 through February 2009. Table 1 shows some clinical and demographic characteristics of the collected data.

Age 51.07 ± 17 years

Male 71.4% (65)

Personal history
- COPD 8.9% (8)
- Inmuno-deficiency 11.1% (10)
- Diabetes 13.1% (12)
- Cirrosis 6.7% (6)
- Used pre-steroids 11.1% (10)
- Solid tumor 10% (9)
- Congestive heart failure 5.6% (5)
- Chronic renal failure 4.4% (4)

The length of stay was 34.48 ± 23.9 days. Isolation of Acinetobacter occurred most frequently in the second week from admission (13.14 ± 8 days). The reasons for admission were medical causes in 48.4%, major trauma in 38.5% and surgical patients in 13.2% patients. Only 13.2% of patients were re-admissions from other services, primarily from internal medicine (11%) and neurosurgery (9%).

Up to 40.4% of patients had isolated acinetobacter in multiple sites. Respiratory infection was the most frequently developed (89%), followed by bacteraemia (12.4%) or urinary tract infection (12.4%). Acinetobacter was isolated in cerebral spinal fluid in three patients.

The resistance profile has modified during the study period, but globally we have 83.8% of resistance to carbapenem and 74.4% to ampicillin-sulbactam. The drugs tested with less resistance were amikacin (9.3%), colistin (7.6%), and tigecycline (4.2%). The most used antibiotic was intravenous (65.2%) and inhaled (50.6%) colistin. In more than half of the cases, more than two antibiotics were used to eradicate the infection. The mortality rate was 30.3%.

CONCLUSIONS. Acinetobacter infection occurs more frequently in medical or trauma patients during the second or third week from admission to ICU. The therapeutical arsenal is limited, and the combination of antibiotics is essential to prevent the development of new resistances. Length of stay in the ICU for these patients is prolonged, and the mortality rate is also high.

0769

CEFOPERAZONE - SULBACTAM FOR TREATMENT OF INFECTIONS BY PAN—RESISTANT ACINETOBACTER BAUMANNII IN THE ICU

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INTRODUCTION. Acinetobacter baumannii has a relevant clinical implication in ICUs due to elevated number of infections caused by this microorganism; the prevalence of CRAB (Cerbapenem Resistant Acinetobacter) and pan-resistant A. baumannii is on the increase leaving few therapeutic options and high mortality (40–70%). Various antimicrobial regimes have been tried including Colistin, Rifampin etc. with high incidence of adverse effects. The present study was done to evaluate the safety and therapeutic efficacy of cefoperazone plus sulbactam in treating nosocomial infections caused by this strain in an Indian ICU.

METHODS. This open-label prospective study was done in 50 adult patients admitted to the ICU over a period of 12 months. Upon admission to ICU, besides standard investigations, cultures were sent from Blood, Urine, drains, surgical site and BAL (Bronchoalveolar Lavage) and repeated after 48 h, on day5, day7 and on clinical cure. Upon isolation of A. baumanni, cefoperazone (2 g)—sulbactam (2 g) (Magnex Pfizer, India) was initiated as intravenous infusion over 60 minutes every 6–8 h and was continued till resolution of pathology requiring admission to ICU.

The parameters studied included clinical, microbiological and radiological cure and complete blood count, liver and kidney functions and Prothombin Time.

RESULTS. 31 males and 19 females, mean (SD) age 43.9 $\pm$ 2.4, were studied. The patient population comprised of Head Injury (22%), Chest trauma (8%), Polytrauma (18%), COPD (22%), Post-operative (18%), Pneumonia (6%) and Sepsis syndrome (6%). A. baumannii was isolated from 88% specimen of BAL, 8% from surgical site, 2% from drain and 2% of blood cultures. Microbiological cure was obtained in all the 50 patients while 44 and 46 patients had radiological and clinical cure, respectively ($p < 0.001$, significant). Mild increase in liver enzymes was observed in 7 patients which was not significant ($p > 0.05$); Sulbactam had to be discontinued in one patient ($p > 0.05$) due to increased S. Bilirubin and liver enzymes. 47 patients were discharged from the ICU ($p < 0.001$), one with residual paresis while antibiotic intervention (change of therapy) was required in 4 patients ($p > 0.05$). Mean length of stay in ICU was 10.4 $\pm$ 2.5 days, mean number of days on ventilator was 7.3 $\pm$ 2.4 while mean number of days on cefoperezone–sulbactam was 8.4 $\pm$ 1.1 days.

CONCLUSIONS. Data from this study suggest that cefoperazone (2 g) plus sulbactam (2 g) in a dose of 6–8 g/day is safe and effective in the treatment of nosocomial infections in the ICU caused by pan-resistant *Acinetobacter baumannii*.

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A STEP-BASED STRATEGY TO CONTROL MULTI-DRUG RESISTANT *A. BAUMANNII* OUTBREAK IN ITALIAN ICUS

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AIMS. *Acinetobacter baumannii* has emerged as an important nosocomial pathogen. St. Camillo Hospital is a tertiary care 950-bed Institution with 6 ICUs. Since July 2007 a continuous monitoring system of the alert organisms (as *A.baumannii*) was implemented in the hospital ICUs. Surveillance cultures (twice a week) were implemented. The monitoring system has been able to identify outbreaks by MDR A baumannii in at least two of them: Cardio-Surgical ICU and Shock and Trauma ICU, in which MDR A.baumannii isolates reached a peak in June 2008. This was associated to severe infections caused by this bug, raising a great concern. A specific strategy was therefore endorsed in the attempt to control and reduce the spread of MDR *A. baumannii* strains. The full strategy was introduced in the clinical practice starting on September 1, 2008.

METHODS. Different alert levels were defined and for each level specific interventions were planned and implemented in a step wise manner. Step 1 was defined as the presence in the ICU of a single patient carrying *A. baumannii*, while step 2 and 3 were defined by *A. baumannii* isolation from 2 or more patients. In each corresponding step the operative measures have been activated to limit or to eradicate the diffusion of the micro organism. The principal procedures adopted have been: the integrated work-team of physicians, nurses and epidemiologists, the patient isolation, the standard and contact precautions of health care providers and visitors, the hands decontamination, strengthening environmental cleaning and the antibiotic resistance monitoring. The level of awareness was further reinforced as one of the ICU was enrolled into the MOSAR-ICU study project. Clinical and surveillance cultures were collected as usual. Data of the alert organisms monitoring database were analysed to understand whether the adopted strategy was effective in reducing the spread of MDR A baumannii strains.

RESULTS. From April 2008 to March 2009, 1302 patients were admitted to the ICUs. A. baumannii was cultured from 239 specimens in 152 patients. The trend in MDR A.baumannii isolation progressively decreased after the introduction of the step based control system and the adoption of hands hydroalcholic decontamination. Since September 2008 we observed no new epidemic outbreaks and the number of the overall isolations of A.baumannii showed a 30% reduction from 8 versus 5% of the positive samples.

CONCLUSIONS. After the adoption of the step based control strategy there has been a trend towards a progressive reduction in *A. baumannii* isolations. The observational time is too short to allow any sound conclusion about the efficacy of the adopted strategy, nevertheless the introduction of the step-based control strategy there were no more epidemic outbreaks. The step response seems to improve health care provider adherence to recommendations and might improve the level of efficiency in the use of resources.

0771

PREVALENCE OF BACTEREMIA DUE TO PAN-RESISTANT ACINETOBACTER IN TERTIARY INTENSIVE CARE UNIT

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INTRODUCTION. Pan-resistant bacteremia is frequently a life-threatening complication in critically ill patients admitted to intensive care units

OBJECTIVES. To determine prevalence, risk factor; outcome of Pan-resistant Acinetobacter in tertiary care hospital open ICU

METHODS. A 3-year retrospective observational study conducted in the open ICU of a tertiary care hospital at Mumbai, India. Patients whose blood cultures were positive for Acinetobacter were included in the study. We defined multi-drug resistant (MDR) acinetobacter as those resistant to Cephalosproin, Aminoglycosides and Beta-Lactams puls Beta Lactamase inhibitors and susceptible to Carbapenems, Tigecycline and Polymyxin group. We defined pan-drug resistant (PDR) acinetobacter as those sesitive to only Tigecylcine and Polymyxin group.

The incidence, risk factors and mortality were assessed from the data.

RESULTS. From February 2006 to March 2009, *Acinetobacter* spp. was isolated from blood in 52 critically ill patients. The mean incidence of isolation was 17/1,000 admissions.

Out of 52, 28 was multi-drug resistant bacteria while 24 was pan-drug resistant bacteria. The main risk factors for isolation of acinetobecter were malignancy (32.5%), prolonged ventilation (17.88%), Catheter related blood stream infection (15%). Crude mortality was 80% with pan-drug resistant acinetobacter while 40% with susceptible bacteria.

CONCLUSIONS. Acinteobacter is a common nosocomial cause of infection in critically ill patients admitted to Intensive Care Unit of our hospital. Pan-resistant Acinetobacter is common in our ICU (Table 1)

TABLE 1 RISK FACTOR FOR PAN-RESISTANT ACINETOBACTER

Risk Factors	No. Of patients	Percentage
Prolonged Antibiotics	20	38.5
Malignancy	17	32.5
Prolonged Ventilation	10	17.88
CRBSI	08	15

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0772

LONGITUDINAL TRENDS OF *PSEUDOMONAS AERUGINOSA* RESISTANCE IN SPUTUM ISOLATES FROM CHRONICALLY VENTILATED PATIENTS

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AIMS. The carriage and infection rates by resistant bacteria in chronic ventilation units are high and lead to elevated morbidity, mortality and cost of care. The fact that some patients are ventilated for lengthy periods provides us a unique opportunity to examine trends in the prevalence of antimicrobial resistance over time.

METHODS. In the chronic ventilation units in Herzog Hospital, sputum cultures are obtained routinely every 3–4 weeks and as needed for evaluation of fever. *Pseudomonas aeruginosa* is the most prevalent isolate. We analyzed the change in its antimicrobial susceptibility pattern over time. Included in the study were only patients with at least seven separate sputum isolations isolates of *P. aeruginosa*. We calculated in each patient, and for each antimicrobial agent, the number of times the resistance status remained the same, increased, or decreased between two consecutive cultures. For all patients, the proportions for either event (no change in resistance status, increase, or decrease) was calculated for each antibiotic.

RESULTS. From May 2005 to August 2007, *P.aeruginosa* was isolated from the sputum of 181 patients. Ninety-six patients, in whom there were at least seven separate isolations, were included in the analysis. The average number of isolates per patient was 18 (range 7–60). The average time of follow up was 407 days (range 47–793). The proportion of resistance to the antimicrobial agents was: piperacillin–tazobactam 25%, amikacin 35%, piperacillin 37%, imipenem 45%, ceftazidime 55%, gentamicin 63%, and ciprofloxacin 76%. The pattern of resistance with time varied between patients; in some, it was stable over time, in some it decreased or increased once, and in others decreased and increased several times. The overall incidence of no change, increase, or decrease in antimicrobial resistance between two consecutive cultures for the various antimicrobial agents was, respectively: amikacin 62.9, 19.1. 18.0%; ceftazidime 63.7, 18.7, 17.6%; imipenem 65.0, 17.7, 17.3%; gentamicin 70.8, 15.3, 13.9%; piperacillin 70.6, 14.6, 14.8%; ciprofloxacin 77.5, 11.9, 10.6%; piperacillin–tazobactam 78.1, 10.7, 11.2%. The distribution of events was statistically significantly different between three groups of antimicrobials ($p < 0.001$). The first group included: amikacin, ceftazidime and imipenem; the second group gentamicin and piperacillin and the third ciprofloxacin and piperacillin–tazobactam.

CONCLUSIONS. Contrary to our expectation, the trends in antimicrobial resistance over time were found to be complex and unpredictable. Further analysis is needed to define whether factors such as patient characteristics, infection control policies and patterns of antimicrobial administration also influence this pattern.

0773

ACINETOBACTER INFECTION VERSUS OTHER NOSOCOMIAL PATHOGENS IN AN INTENSIVE CARE UNIT

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INTRODUCTION. Acinetobacter is a serious nosocomial problem in the intensive care unit (ICU) setting, due to its persistence in the hospital environment and its broad antimicrobial resistance patterns, with important clinical and economic consequences. In Spain, Acinetobacter is the third leading pathogen after Pseudomonas, and Staphylococcus. Although this pathogen can be associated with an elevated crude mortality, it only contributes to this mortality in a subset of high-risk patients. Adequate empirical antimicrobial therapy is a protective factor, even though the therapeutic options are often limited. We compare epidemiological, clinical and microbiological data in two groups of patients infected with and without Acinetobacter.

METHODS. A case-control study from October 2007 to December 2008. Information was collected on 121 patients hospitalised in our ICU setting with different reason for admission. All patients with microbiologically documented infection due to Acinetobacter were defined as cases (AG: 66). The control group (NoAG: 61) were infected due to other pathogens. Demographic, clinical and microbiological data, mortality rate and length of stay were evaluated. The data were expressed in mean ± standard deviation and percentages. Student *t* test and chi-square test were used.

RESULTS. Table 1 expresses some of the data. No differences in underline diseases were observed between the two groups. There were more central venous cathetheres in AG (AG 95% vs. NoA group 88.5%; $p = 0{,}024$). The infection developed later in AG (AG 2th-3rd week vs. NoAG 1st week; $p = 0.0001$). Thrombocytosis was higher in AG (AG 311,109,4 ± 216,842,4; NoAG 185,137,9 ± 97,866; $p = 0.0001$). There were not statistical significant differences in mortality (AG 31.2% vs. NoAG 36%; $p = 0.56$) but in length of stay (AG 31.8 ± 18.14 days vs. NoAG 12.31 ± 9.4 days; $p = 0.0001$).

TABLE 1

	AG ($n = 66$)	NoAG ($n = 61$)	*p*
Age	50.2 ± 17.5	54.7 ± 18.3	NS
APACHE II	22.9 ± 7.1	20.6 ± 7.8	NS
Male	74.2%	57.3%	0.045
Reason for admission			
Medical	48.4%	60.6%	0.02
Surgical	10.6%	24.5%	0.02
Traumatism	40.9%	14.7%	0.02

CONCLUSIONS. In our setting, Acinetobacter infection occurs more frequently around 2–3 week of stay in ICU and is associated with longer length of stay, however, mortality seems not to be affected. Thrombocytosis, that frecuently appears in this kind of infections, could be a useful tool to predict Acinetobacter infections and iniciate prompt and adequate therapy. More trials must be conducted to assess this point.

0774

NOSOCOMIAL STAPHYLOCOCCUS AUREUS BLOODSTREAM INFECTIONS IN A PEDIATRIC INTENSIVE CARE UNIT: EPIDEMIOLOGY AND IMPACT OF METHICILLIN RESISTANCE ON OUTCOME

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OBJECTIVE. The incidence of nosocomial methicillin-resistant *Staphylococcus aureus* (MRSA) infections is increasing and constitutes a serious problem in the intensive care units. The aim of this study was to describe the epidemiological profile of nosocomial *S. aureus* bloodstream infections (BSI) in a pediatric intensive care unit (PICU) and to assess the impact of methicillin resistance on outcome.

METHODS. Data were collected as a part of an epidemiological surveillance program of nosocomial infections conducted in a PICU between January 2004 and March 2008. All patients who remained in the PICU for more than 48 h were included. Centers for Disease Control and Prevention criteria were applied for the diagnosis of nosocomial BSI. Nosocomial infections rates were calculated as incidence and density incidence rates (per 1000 patient-days). The outcome of patients developing *S. aureus* BSI was studied in terms of mortality and length of stay.

RESULTS. During the study period, 1,245 patients (mean age = 5.5 ± 20.6 months; mean length of stay = 11 ± 19 days) were included. Twenty-two patients (mean age = 3.4 ± 9.8 months; mean length of stay = 22.5 ± 13.8 days) developed 23 episodes of nosocomial *S. aureus* BSI accounting for 20.2% of nosocomial BSI and 57.5% of nosocomial BSI caused by gram-positive rods; with an incidence rate of 1.8% and a density incidence rate of 1.6 per 1,000 patient-days. The mean time of onset of these infections was 7.4 ± 3.6 days. Seventeen episodes of *S. aureus* BSI (73.9%) occurred in patients with central venous catheter and 5 episodes (21.7%) were associated with nosocomial *S. aureus* pneumonia and/or laryngotracheitis. The overall mortality rate of nosocomial *S. aureus* BSI was 34.8%.

S. aureus was methicillin resistant in 8 episodes (34.8%) with a density incidence rate of MRSA nosocomial BSI of 0.58 per 1,000 patient-days. Compared with patients developing nosocomial BSI due to methicillin-susceptible *S. aureus*, those with MRSA BSI had a significantly higher rate of mortality (75 vs. 13.3%; $p = 0.006$).

CONCLUSIONS. The density incidence rate of *S. aureus* BSI was of 1.6 per 1000 patient-days in our unit. *S. aureus* was methicillin resistant in 34.8% of episodes with a density incidence rate of MRSA nosocomial BSI of 0.58 per 1,000 patient-days. Methicillin resistance seems to increase the mortality rate in patients developing nosocomial *S. aureus* BSI.

0775

METHICILIN-RESISTANT STAPHYLOCOCCUS AUREUS (MRSA) RESPIRATORY TRACT INFECTIONS IN ICU PATIENTS: LACK OF INFLUENCE OF REDUCED SUSCEPTIBILITY TO VANCOMYCIN (VA) AND LINEZOLID (LZD) ON OUTCOME

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INTRODUCTION. MRSA is an important cause of ventilator associated pneumonia (VAP). Emergence of MRSA strains with reduced susceptibility to VA has prompted an increase of empirical use of LZD in this setting.

OBJECTIVES. To describe the epidemiology of MRSA respiratory tract infections in critically ill patients and evaluate the influence of VA and LZD minimum inhibitory concentration (MIC) on clinical resolution and mortality.

METHODS. 6,882 patients were admitted from June 2006 to June 2008. The 40 (0.58%) mechanically ventilated patients with positive cultures for MRSA in respiratory secretions were retrospectively studied. MICs for VA and LZD were determined by E-test. Clinical variables were recorded, including APACHE II, SOFA, and clinical pulmonary infection (CPIS) scores, and previous MRSA colonization. VAP was defined as >1 SIRS criterium. And new radiological infiltrates. Antimicrobial treatment, whether empirical, delayed >1 day, or inappropriate, need for change, length of stay (LOS) and mortality were registered. Qualitative variables are expressed as totals and percentages and quantitative variables as mean or median and interquartile range. Univariate and multivariate analyses were performed.

RESULTS. Median age was 69 (49–76), 31 (77%) were male, urgent admission 31 (77%), sepsis 15 (37.5%), surgical (27.5%). COPD 14 (35%), prior antimicrobials 40 (100%), corticosteroids 10 (25%), APACHE II 18 (10–22), SOFA 4 (3–7). CPIS 6 (5–9). Previous MRSA colonization 21 (52%), VAP 25 (67.5%), tracheobronchitis 7 (17%), lower respiratory tract colonization 3 (7.5%). Empirical therapy 19 (47.5%), VA 14 (35%), LZD 17 (42%), VA MIC = 1 μg/ml 13 (43.3%) and MIC = 2 μg/ml 17 (56.7%), VA resistant strains 0, LZD MIC < 4 μg/ml 15 (37.5%), linezolid resistant strains (MIC > 4 μg/ml) 4 (10%), inappropriate treatment 8 (20%), need for change 9 (22%), treatment delay 9 (25%), treatment failure 10 (25%), clinical resolution 27 (67.5%), Hospital LOS 60 (36–92), ICU LOS 34 (10–54). ICU mortality 32%, hospital 45%. The variables associated significatively with mortality in univariate analysis were: fever *p* 0.04, OR 0.2 (0.06–0.9), Leucocytosis *p* 0.004, OR 15.4 (1.7–138), clinical resolution *p* 0.003, OR 0.005 (0.006–0.5) and comorbidity (oncologic patients) *p* 0.015, OR 6.3 (1.37–29). In the multivariate analysis no variables were independently associated with mortality.

CONCLUSION. Incidence of MRSA in respiratory tract secretions in our patients was low. 67% developed VAP. Antibiotic choice, treatment delay and VA and LZD MICs were not related to outcome.

0776

STUDY OF INCIDENCE AND RISK FACTORS OF METHICILLIN-RESISTANT STAPHYLOCOCCUS AUREUS (MRSA) INFECTION AMONG ALEXANDRIA UNIVERSITY PEDIATRIC INTENSIVE CARE ADMISSIONS

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OBJECTIVE. To assess the incidence and risk factors of MRSA among Pediatric Intensive Care (PICU) admitted patients.

METHODS. An 18 months prospective study (June2007–December 2008) included all admitted patients ($n = 480$). All demographic and clinical data, exposure to possible risk factors during last 12 months, the length of hospital stay (LOS), and fate were recorded. Blood, urine, stool and throat swab cultures and whenever indicated cerebrospinal fluid (CSF) and empyema cultures were performed on admission. The tip of the IV cannula and endotracheal tube (ET) (if present) were cultured 48 h after admission. Cases suspected of nosocomial infection were subjected to re-culture according to the affected system. Suculture on ORSAB media were performed for MRSA detection for positive Staphylococcus aureus (SA) cultures. MRSA infection were classified as community acquired (CA-MRSA) if detected on admission and hospital acquired (HA-MRSA) if acquired >48 h from admission.

RESULTS. SA infection represented 15% of admissions (72/480), divided into three groups: methicillin-sensitive SA (MSSA) (4.2%), CA-MRSA (7.5%) and HA-MRSA (3.3%). Study of risk factors among CA-MRSA compared to HA-MRSA cases, showed higher percent of patients referred from wards ($p < 0.001$), hospitalized within the last 12 months ($p = 0.0005$), having surgery within last 12 months ($p = 0.0102$), having an outpatient visit within last 12 months ($p < 0.001$), having a chronic disease ($p = 0.0009$), previous use of injectable drugs ($p = 0.0009$); while it was statistically less as regards PRISM III score >12 on admission ($p = 0.0475$), less LOS > 5 days ($p = 0.0001$). There was a higher incidence of mortality among MRSA cases compared to MSSA cases ($p < 0.001$). A multiple logistic regression analysis for predicting MRSA infection showed that the risk factors for HA-MRSA were PRIM III score >12 on admission ($p = 0.013$, OR 15.735 with 95% CI 1.78–138), LOS > 5 days ($p = 0.018$, OR 20.68 with 95% CI 1.69–252), hospital admission within last 12 months ($p = 0.048$, OR 271.7 with 95% CI 18–4,092); with the model success to diagnose 97.1% of total cases; and for CA-MRSA risk factors: residence in rural areas ($p < 0.001$, OR 0.007 with 95% CI 0.000–0.116), hospital admission within last 12 months ($p < 0.001$ OR 64.7 with 95% CI 6.88–608), having an outpatient visit within last 12 months ($p = 0.001$ OR 39 with 95% CI 4.19–363) and use of antibiotics within last 12 months ($p < 0.001$ OR 571 with 95% CI 33.7–9676); with the model success to diagnose 97.4% of total cases.

CONCLUSION. There is a high incidence of MRSA in Alexandria University PICU, with CA-MRSA stated to be an alarming community organism. Minimizing risk factors, early diagnosis and judicious use of antibiotics are the cornerstone for MRSA reduction in the community.

0777

CIPROFLOXACIN AND COLONIZATION/INFECTION WITH *STAPHYLOCOCCUS SPP.* IN CRITICALLY ILL PATIENTS

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INTRODUCTION. *Staphylococcus spp* continues to be a major concern. The rate of staphylococcal colonization/infection in critically ill patients is influenced by several factors one of the the most important being the policy of antibiotic use. Previous studies have shown a strong correlation between ciprofloxacin use and rate of *Staphylococcus aureus* infection. Our study investigated changes in *Staphylococcus* spp. rate of colonization/infection and their antibiotic susceptibility in relation with changes in antibiotic use in ICU patients.

METHODS. A prospective study was performed in a 19 beds mixed ICU on a tertiary care university hospital. Blood, catheters, urine, respiratory tract, peritoneal fluid, pleural fluid, and wound specimens were cultured any time when infection was present or every 4–5 days in case of patients with ICU LOS (length of stay) >5 days (microbiological surveillance). Positive cultures for *Staphylococci* spp. [*Staphylococcus aureus* and *coagulaso-negative* (CN) *staphylococci*] were counted disregarding the infection or colonization status. Antibiotic use was recorded as daily drug doses/100 beds (DDDs). The study included two periods: January–June 2007 (P1—839 admitted pts) and January–June 2008 (P2—779 admitted pts). Comparison between these two periods included overall and site specific rate of positive cultures with *Staphylococi* spp, patterns of antibiotic susceptibility and antibiotic usage.

RESULTS. The overall number of positive cultures with *Staphylococcus aureus* decreased from 127 (15%) in P1 to 85 (11%) in P2 ($p = 0.02$). *CNstaphylococci* decreased from 61 (7%) in P1 to 35 (4%) in P2 ($p = 0.01$). Antibiotic usage decreased by half in P2 versus P1 (68.7 DDDs vs. 113.8 DDDs, $p = 0.01$), with the most significant drop in fluoroquinolones. Ciprofloxacin use dropped from 1st (P1; 16.72 DDDs) to 7th position (P2; 2.15 DDDs) (75% decrease). From 127 clinical isolates of *Staphylococcus aureus* in P1, 94% were ciprofloxacin resistant compared to 46% rate of resistance from 85 positive cultures in P2 ($p < 0.01$). There was a correlation between ciprofloxacin use and *Staphylococcus aureus* colonization/infection rate ($r = 0.70$; 95% confidence interval −0.01–0.94; $p = 0.05$). There was no statistical difference in ciprofloxacin resistance of *CN staphylococci* in P1 (48%) versus P2(50%).

CONCLUSIONS. The drop in ciprofloxacin usage resulted in decreased number of *Staphylococcus* spp. colonised/infected patients and in increased ciprofloxacin sensitivity in *Staphylococcus aureus* isolated in ICU patients.

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Airway management and weaning strategies: 0778–0791

0778

EARLY VERSUS LATE PERCUTANEOUS DILATATIONAL TRACHEOSTOMY (PDT): ARE THERE RELIABLE PREDICTIVE FACTORS?

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INTRODUCTION. There is still a debate, if in patients on mechanical ventilation PDT should preferentially be performed early (i.e. ≤7 days) or late (i.e. >7 days) and in particularly which subsets of patients are prone to have PDT for airway management purposes. In daily clinical practice indication for PDT is mainly based on empirical decision. It would be helpful to have predictive factors to decide which patient should undergo PDT and when. We retrospectively analysed our database of patients having PDT from 2003 through 2006 in order to rule out factors that resulted in early or late PDT.

OBJECTIVES. The objective of the analysis was to find out if there are specific patient related factors associated with early or late PDT. These factors should be implemented in a list that should help to reliably predict need and optimum time of potential PDT.

METHODS. The retrospective study was performed in a mixed surgical and trauma ICU in a university hospital. Patient charts were reviewed for demographic data and time of PDT (days after admission). Reasons of admission, comorbidities and severity of illness were evaluated. Patients were assigned to an "early" (≤7 days) and "late" (>7 days) PDT group. According to these groups coexisting factors and patient characteristics were evaluated. Statistical analysis was performed using a chi square test or a Mann–Whitney *U* test where appropriate. $P < 0.05$ was regarded as significant.

RESULTS. From 2003 through 2006 PDT was performed in 248 patients; 139 patients underwent early and 109 patients late PDT (Table 1)

TABLE 1

	Early PDT	Late PDT	*P*
Age	69 [56–74]	63 [51–72]	0.052
BMI (kg/m^2)	25 [23–28]	25 [23–28]	*n.s.*
COPD	24%	14%	0.07
Elective surgery	26%	34%	*n.s.*
Emergency surgery	65%	60%	*n.s.*
Neurosurgical admission	28%	12%	0.003
Abdominal surgery	24%	41%	0.007
Trauma surgery	13%	20%	*n.s.*
SAPS II	45 [32–54]	50 [36–59]	0.03

Data are given as median [interquartile range] or as percent. *n.s.* not significant

CONCLUSIONS. Neither demographic characteristics nor comorbidity factors were clearly associated with early or late PDT. Whereas neurosurgical admission was clearly related to the early PDT group, abdominal surgery was in contrast more often represented in the late PDT group. In general, we could not find a unique profile that would assign a patient to early or late PDT.

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0779

PATIENT OUTCOME PARAMETERS AFTER EARLY VERSUS LATE PERCUTANEOUS DILATATIONAL TRACHEOSTOMY (PDT). A RETROSPECTIVE ANALYSIS

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INTRODUCTION. Albeit PDT has become a routinely performed procedure in ICU patients, its effectiveness regarding morbidity, mortality and ICU length of stay (LOS) still needs to be more clarified [1].

OBJECTIVES. The aim of our study was to compare outcome parameters as mortality, morbidity and the ICU LOS in two subgroups of mechanically ventilated surgical patients undergoing either early (<7 days, $n = 139$) versus late (>7 days, $n = 109$) PDT.

METHODS. From 2003 through 2006 patients were included to the study (adult, non-cardiac surgical and trauma patients) undergoing a PDT during the course of their ICU stay due to the need for prolonged mechanical ventilation. The timing for tracheostomy was set by the responsible physicians depending from the patient's conditions and based on a common consense. PDT was performed exclusively by experienced physicians using the PercuTwist technique (Rüsch AG, Germany). The main outcome measure of our study were mortality, morbidity and the ICU length of stay. Statistical analysis of the data was performed by means of the Mann–Whitney test. Statistical significance was assumed at $p < 0.05$. Data are presented as median and [25–75%] interquartile range.

RESULTS. 248 patients were included in the study. Early PDT was performed on day 5 [4–6] after admission in 139 patients, whereas late PDT was performed on day 10 [9–12] after admission in 109 patients. Mortality in the early PDT group (32/139, 23%) did not differ from the late PDT group (29/109, 27%) [$p = 0.62$]. Procedure related morbidity was not statistically different between the groups (early PDT group 22/139, 16% vs. late PDT group 8/109, 7% [$p = 0.07$]).

The results of the ICU LOS are presented in Fig. 1. The ICU length of stay significantly differed between the two groups and was roughly half as long in the early PDT group.

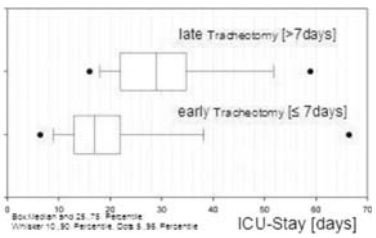

Fig. 1

CONCLUSIONS. Our data clearly indicate tht early PDT results in shorter ICU length of stay. Moreover, the results are encouraging in view of further large-scale studies attempting to demonstrate the benfits of early PDT.

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0780

PERCUTANEOUS DILATATIONAL TRACHEOSTOMY (PDT) AND WEANING FORM SEDATION AND VASOPRESSORS

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INTRODUCTION. PDT is an established safe measure for airway management in critically ill patients. But beyond airway management PDT enables to process with reduction in sedation and often also vasopressor administration. We retrospectively analysed our database of patients having PDT from 2003 through 2006 in order to evaluate the time course of sedation and vasopressor administration before and after PDT.

OBJECTIVES. The objective was to describe the effectiveness and time course of reduction in sedation and vasopressor dosage before and after PDT.

METHODS. The retrospective study was performed in a mixed surgical and trauma ICU in a university hospital. Patient charts were reviewed for weight adjusted daily doses of sedatives (propofol, sufentanil and midazolam) as well as vasopressors (noradrenaline) in patients undergoing PDT. The time interval reviewed was 3 days before and 3 days after PDT. Statistical analysis was performed using Wilcoxon signed rank test. $P < 0,05$ was regarded as significant.

RESULTS. From 2003 through 2006 PDT was performed in 248 patients.

Data are given as median values.

CONCLUSIONS. PDT was associated with clear changes in sedation management and probably as a consequence resulted in consecutive reduction of vasopressor need. After performance of PDT a majority of patients could be weaned from sedatives over the next 3 days. This might give a potential role of PDT in strategies pursuing weaning from sedation, that otherwise might have failed (Table 1)

TABLE 1

	3 days before PDT	3 days after PDT	*P*
Propofol Median (mg/kg/d)	37.2	3.3	<0.001
Midazolam Median (mg/kg/d)	0.76	0.48	<0.001
Sufentanil Median (µg/kg/d)	3.1	1.4	<0.001
Noradrenaline Median (mg/kg/d)	0.061	0.009	<0.001

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0781

EARLY EXPERIENCE WITH A SINGLE-STAGE BALLOON-DILATATIONAL PERCUTANEOUS TRACHEOSTOMY DEVICE

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INTRODUCTION. Percutaneous dilatational tracheostomy (PDT) is one of the commonest invasive procedures performed in mechanically ventilated patients. There is increasing evidence to show that PDT is associated with fewer complications than surgical tracheostomies (Delaney 2006; Freeman 2000). The ideal PDT technique should reduce bleeding by preventing damage to local blood vessels and tamponade bleeding, eliminate posterior tracheal wall trauma and minimise time from dilation to tracheal tube insertion. Cook recently launched the Ciaglia Blue Dolphin PDT set which involves single stage dilation with a radial balloon dilator allowing the insertion of a pre-loaded tracheostomy tube.

METHODS. The procedure was performed in accordance with the manufacturer's recommendations. However, we used a blunt dissection technique to visualise the trachea, and in order to secure the balloon position during inflation, the operator held the balloon steady with one hand and inflated the balloon by using their abdomen to depress the plunger of the syringe. This allowed the procedure to be performed by a single operator. After the first five cases, subsequent procedures used a balloon inflation time of at least 10 s. All PDTs were performed under bronchoscopic guidance.

RESULTS. 31 CBD tracheostomies were performed of which 30 were successful. The failed insertion was attributed to an initial incision which was too small; there were no clinical repercussions. In one case the stoma had to be dilated twice because the CBD device slipped on the lubricant gel. There was no clinically significant bleeding or desaturation.

As the CBD was used for teaching we did not formally time the procedure. However, we noted that the operators who had inserted several CBD tracheostomies did so in 4–6 min from skin incision.

The operators felt that the balloon dilatation does reduce the downward pressure onto the trachea as asserted by the manufacturers.

CONCLUSIONS. We found the CBD to be a safe and straightforward device. Minimal force is required to insert the CBD dilator, which theoretically should result in less damage to the posterior tracheal wall and tracheal rings. The single stage insertion should minimse the risk of creating a false passage. Our current experience of the CBD would lead us to recommend at least a 2 cm incision, blunt dissection, at least 10 seconds of dilation and a firm grip on the balloon during inflation to prevent slippage. A multicentre database could confirm our clinical suspicions.

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EVALUATION OF PREDICTORS INDEXES OF SUCCESS OR FAILURE IN THE WEANING FROM INVASIVE MECHANICAL VENTILATION

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OBJECTIVE. To verify and analyze the predictors indexes of success or failure of ventilator weaning in the Intensive Care Unit of Hospital Santa Luzia, Brasilia-DF.

METHODS. The study was carried out from November 1, 2008 to March 31, 2009. There were included in the study adult patients with indication for weaning from mechanical ventilation (MV). The use of protocols with evidence based criteria can reduce the failure of weaning from MV. We evaluated the correlation between success and failure with the predictors indexes of maximal inspiratory pressure (MIP), maximal expiratory pressure (MEP) and Index of rapid and superficial respiration (IRSR).

RESULTS. There were studied 58 patients, 34 (58.62%) males and 24 (41.38%) female. Medium APACHE II index of 13.82 ± 8.90 and mean SAPS II 36.82 ± 15.79. The success index of ventilator weaning from was 86.20% (50 patients) and failure index of 13.80% (8 patients). The MIP success' group was 48 ± 10.30 cmH_2O and the failure's group was 48.13 ± 6.51 cmH_2O ($p = 0.48$). It was also not observed significant difference in the group of IRSR between success and failure, 45.96 ± 20.68 and 47.41 ± 20.40 ($p = 0.42$), respectively. In relation to the MEP, there was statistical difference ($p = 0.02$) between the group of success and failure, 71.80 ± 31.72 cmH_2O and 53.13 ± 20.86 cmH_2O, respectively.

CONCLUSION. We conclude that there is a correlation between success and failure of weaning from mechanical ventilation and the measurement of maximal expiratory pressure.

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WHAT CRITERIA DO NURSES PERCEIVE IMPORTANT AND USE TO IDENTIFY THE ABILITY OF A COPD PATIENT TO WEAN OFF THE VENTILATOR?

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AIM. The process of weaning from mechanical ventilation is fundamental to the management of patients with Chronic Obstructive Pulmonary Disease (COPD) and their outcome. The literature does not support methodologically rigid techniques of measuring a parameter to continue or discontinue ventilatory support and there are no objective criteria to determine the patient's tolerance of spontaneous breathing. Careful clinical assessment is required from the clinician to identify the patient's readiness for subsequent discontinuation of ventilatory support and ultimately extubation. The purpose of this paper is to present the criteria that nurses use to decide on the weaning of long-term ventilated patients.

METHODS. Ten COPD patients were selected during a 5-month period in a 12-bedded Intensive Care Unit in Greece. Observation of the nurses looking after those patients while weaning, and 24-h chart and medical notes review to follow the patient's progress from a pre-weaning stage to their discontinuation from the ventilator, extracted information on which criteria the nurses used to make decisions on the patients' weaning process. The nurses were then interviewed to investigate their perceptions of the patients' ability to wean. Data was analysed thematically using the qualitative analysis software NVivo (version 8).

RESULTS. An important theme of decision-making identified was nurse's assessment of the patient's ability to wean. The patient's clinical appearance and the clinical indexes (tidal volume, respiratory rate, oxygen saturation) guided nurses' decision-making. The criteria used to define a Spontaneous Breathing Trial (SBT) tolerance were not single parameters but integrated indexes which included several physiologic parameters as well as clinical judgment, incorporating such difficult-to-quantify factors as 'anxiety', 'discomfort', and 'clinical appearance'. Significant criteria considered were a reversal underlying cause of respiratory failure, adequate oxygenation and ability to initiate a breath, the level of consciousness after reducing the sedation and cardiovascular stability. Blood gases and oxygen requirements were deemed when making the decision to reduce the support from the ventilator, while the consciousness level and cough reflex where considered for extubation.

CONCLUSIONS. In difficult to wean patients, such as the COPD, nurses' supervision of the patient can influence the decisions made during the weaning process. Nurses perceived their role crucial because they knew the patient's behavior better than the doctor and influenced the decisions about weaning.

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EFFECTS OF MECHANICAL INSUFFLATION-EXSUFFLATION IN PREVENTING RESPIRATORY FAILURE AFTER EXTUBATION: A RANDOMIZED CONTROLLED TRIAL

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BACKGROUND. Emphasis on early extubation, coupled with the use of noninvasive ventilation (NIV), decreases the incidence of re-intubation, ventilator-associated pneumonia, mortality and ICU length of stay. However, secretion encumbrance and impaired airway clearance are associated with NIV failure. Mechanical Insufflation-Exsufflation (MI-E) is an assisted coughing technique that has been proven to be very effective in patients under NIV.

AIMS. To assess the efficacy of MI-E for airway clearance, as part of a weaning protocol for patients at risk of respiratory failure after extubation.

METHODS. Patients under mechanical ventilation (MV) for more than 48 h with specific inclusion criteria for a weaning protocol were enrolled and randomized in two groups: Group A patients were put on a weaning protocol that included standard medical therapy (including NIV, if necessary) and Group B patients were submitted to the same weaning protocol with the application (minimum 3 times a day) of MI-E sessions. Re-intubation rates, ICU length of stay and NIV failure rates were analyzed as outcome variables.

RESULTS. Forty-nine patients (18 females) with a mean age of 62.2 ± 18.7 years old were randomized in Group A (control group, $n = 26$, mean SAPS II 48.3 ± 18.9, mean age of 62.5 ± 21.2) and Group B (study group, $n = 23$, mean SAPS II 45.1 ± 12.1, mean age of 62.6 ± 13.7).MV time before enrollment was 10.8 ± 6.2 days for Group A and 12.3 ± 9.4 days for Group B patients. In the first 48 h after extubation, NIV for respiratory failure was used in 55% of Group A and 40% of Group B patients. We found significant differences ($p < 0.05$) in re-intubation rates (50% for Group A vs. 14% for Group B). Reasons for re-intubation for group A and B patients, respectively were: severe hypoxemia (25 vs. 55%), respiratory distress with severe acidosis (40 vs. 30%), hemodynamic instability (12 vs. 8%), decreasing level of consciousness (10 vs. 4%) and high risk of cardio-respiratory arrest (13 vs. 3%).Considering only the sub-group of patients that used NIV, the re-intubation rates were significantly different ($p < 0.05$): 80% for Group A and 6% for Group B. All re-intubations in this sub-group were related to NIV failure. Mean of total ICU length of stay was lower in Group B (16.8 ± 15.6 days) than in Group A (18.2 ± 8.3 days). We also found that mean ICU length of stay pós-extubation was significantly lower in Group B than in group A (3.1 ± 2.1 vs. 7.1 ± 7.4 days, $p < 0.05$).

CONCLUSIONS. Inclusion of MI-E in a weaning protocol has a positive impact in outcomes, namely reducing re-intubation rates and ICU length of stay. This technique seems to be more efficient in improving the efficacy of NIV in patients with respiratory failure after extubation.

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EFFECTS OF PERIODIC HYPERINSUFFLATION ON REGIONAL LUNG VENTILATION IN PATIENTS WITH NEUROMUSCULAR DISEASE

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BACKGROUND. The effects of intermittent positive pressure breathing (IPPB) and abdominal belt on regional lung ventilation in neuromuscular patients are unknown.We underwent a prospective crossover physiologic short-term study in stable neuromuscular patients to determine the effects of IPBB with or without abdominal belt on regional lung ventilation.

METHODS. IPPB was performed as 30 consecutive deep breaths up to 30 cmH_2O face mask pressure each: 10 in supine, 10 in left lateral and 10 in right lateral position. Each patient received IPPB sessions with or without an abdominal belt in a random order at 1 day intervals. Patients were then followed-up to 3 h after the end of IPPB sessions. Lung ventilation was measured using electrical impedance tomography (VTEIT expressed in arbitrary units a.u.) in four lung quadrants. Baseline tidal volume (VT) and exhaled lung volume (VTE) after each deep breath were also measured.

RESULTS. Fourteen patients with neuromuscular disease were analyzed in the follow-up part of the study and 12 in the IPPB part of the study. With IPPB, baseline [median (interquartile range)] V_T was 0.25 (0.10) increased to VTE amounting to 1.48 (0.81) L ($P < 0.0001$). With IPPB, baseline global V_{TEIT} increased from 14 (28) up to 126 (98) a.u. ($P < 0.00001$). In supine position, V_{TEIT} was significantly greater in the anterior than in the posterior lung regions ($P < 0.0001$). The abdominal belt was not significant during IPPB. Within the 3 h period following IPPB, global V_{TEIT} was greater than baseline and greater with than without the abdominal belt. The regional ventilation did not change significantly over time.

CONCLUSIONS. In patients with neuromuscular disease, IPPB in the supine position increased ventilation to the anterior parts of the lung. The abdominal belt during IPPB maintained the ventilation higher than baseline for 3 h.

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INTENSIVE CARE NURSES' KNOWLEDGE AND MANAGEMENT OF TRACHEAL TUBE CUFFS

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INTRODUCTION. High volume low pressure cuffs are used to seal the extraluminal airway. In this study, knowledge and management of cuffs were investigated in Flemish Intensive Care Unit (ICU) nurses.

METHODS. Survey at the Flemish Society for Critical Care Nurses' annual congress (Nov 2008), using a questionnaire about current practice and a 10-item knowledge test.

RESULTS. We collected 591 questionnaires (response rate 82%); 75% of respondents were female, 50% had >10 years ICU experience, and 82% had a specialized ICU nursing degree; 43% worked in a hospital with >15 ICU beds. Mean nurse:patient ratio was 1:2.2. As targeted cuff pressure in the own ICU, a median of 25 cmH_2O (IQR 10) was reported by 36% and of 30 mmHg (IQR 7.5) by 32%; 36% indicated not to know. Pressure is measured by auditive determination of the minimal occlusive volume in 10%, by manometer in 76%, by finger palpation of the balloon in 41%, and continuously in 0.3% only. Audibly leakage was the most reported indication (79%) for pressure check. In the absence of indications, 53% checks pressure every 8 h. In 46% there is no registration at all in the patient's charts. The median score on the knowledge test was 6/10 (IQR 2). Correct pressure is known to range between 20 and 30 cmH_2O by 52%, and 84% is aware that cuff pressure is measured most accurately by means of a calibrated manometer. It is well known that the purpose of the cuff is to seal the extraluminal airway (95%), that subinflation can lead to aspiration (94%) and overinflation to tracheal injury (98%). Only 15%, however, knew that overinflation can also cause alterations in swallowing, and barely 7% that it is allowed to fill cuffs with sterile water. Linear regression analysis showed male gender ($p = 0.01$), longer working experience ($p < 0.001$) and a larger number of ICU beds ($p = 0.01$) to be independently associated with higher test scores.

CONCLUSIONS. Some aspects of current practice and lack of specific knowledge indicate that Flemish ICU nurses are not fully aware of the importance of strict cuff pressure monitoring. Educational initiatives may be the first step in enhancing their knowledge and management of tracheal cuffs.

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ROLE-RESPONSIBILITIES FOR MECHANICAL VENTILATION AND WEANING IN THE NETHERLANDS

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INTRODUCTION. Responsibility for mechanical ventilation and weaning may differ locally, nationally and internationally due to differences such as intensive care unit (ICU) organizational structure, staffing, skill-mix and leadership models. Nurses in Australia and New Zealand participate actively in ventilation and weaning decisions [1]. Little data describes European nurses' role for ventilation management.

OBJECTIVES. To describe role-responsibilities for mechanical ventilation and weaning in adult ICUs in the Netherlands.

METHODS. We conducted a multi-centre, self-administered exploratory survey sent to nurse managers of all adult ICUs in the Netherlands. The survey was translated and contextually adapted from a survey previously used to describe the profile of role responsibility and nursing scope of practice for key ventilation and weaning decisions in Australia/New Zealand [1]. Surveys were distributed via mail with subsequent phone reminders.

RESULTS. Survey response rate was 69% (72/104), 47/72 (65%) from teaching hospitals, 25/72 (35%) from rural community hospitals. The nurse-patient ratio for mechanically ventilated patients was most often 1:2 (60%) and less frequently 1:1 (13%) or 1:3 (1%). In the remaining 26% of ICUs the nurse-patient ratio varied according to shift. Selection of initial ventilator settings was performed only by physicians in all ICUs (100%). Seniority of medical staff selecting initial ventilator settings was at consultant level for 43/72 (59%) ICUs; 29/72 (41%) ICUs at registrar level or above. Subsequent titration of ventilator settings was performed independently by nurses in most ICUs (67/72, 93%). Only experienced nurses titrated ventilator settings in 41% of ICUs. Weaning readiness was independently determined by nurses in 59/72(82%) ICUs; weaning method was selected by nurses in 62% of ICUs, by physicians in 25% and by others, e.g. ventilation practitioners in 13% of ICUs. Responsibility for determining extubation readiness was mixed (nurses 46% of ICUs, physicians 49%, both 5%). In the majority of ICUs weaning failure was identified by nurses (55/72, 76%). In other units weaning failure was identified by physicians in 8/72 (11%) or by both nurses and physicians 9/72 (13%). Nursing autonomy for ventilation practices (rated on a 10-point numerical scale) was judged as moderate (median 7, IQR 6–8). In most ICUs nurses often (51–75% of required adjustments) independently increased or decreased FiO_2 and frequently (26–50%) independently changed ventilation mode, titrated respiratory rate, tidal volume and inspiratory pressure; independent PEEP adjustment seldom (<25%) occurred.

CONCLUSIONS. In the Netherlands the initial ventilator settings were selected by physicians. Titration of ventilator settings (except changes in PEEP levels), recognition of readiness for weaning and weaning failure were mostly performed by nurses.

REFERENCES. 1. Rose et al (2008) J Clin Nurs 17:1035–1043.

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ROLE OF PHYSIOTHERAPISTS IN THE IMPLEMENTATION OF NON-INVASIVE VENTILATION (NIV)

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INTRODUCTION. Physiotherapists are now available 24 h/day in our university hospital, including for application of continuous positive airway pressure (CPAP) or non-invasive ventilation (NIV). We evaluated the potential benefit of this activity over the 24 h period.

MATERIALS. During a 4 month period (November 6, 2007–March 6, 2008), we prospectively collected data on the number of NIV sessions and their duration in all patients requiring NIV or CPAP in the ICU or in the emergency room as well as arterial blood gases (ABG) before and after the treatment.

RESULTS. Initial settings for CPAP were PEEP 7.8 ± 1.1 cmH_2O and FiO_2 63 ± 22%, and for NIV, PEEP 6.0 ± 1.3 cmH_2O, FiO_2 52 ± 25%, and pressure support 11.1 ± 5.3 cmH_2O. In the NIV group, pH increased from 7.27 to 7.35 ($p < 0.01$) and PCO_2 decreased from 61 ± 20 to 56 ± 25 mmHg ($p = 0.06$), while PaO_2/FiO_2 increased from 159 ± 76 to 194 ± 70 ($p < 0.02$).

Failure of the technique (as defined by need for endotracheal intubation within 6 h) occurred in 34 of 81 patients (42%); these patients had a higher respiratory rate before the initiation of the treatment (37 ± 12 vs. 27 ± 8, $p < 0.01$) and a longer ICU stay (29 ± 28 vs. 13 ± 12 days, $p < 0.01$) than successfully treated patients.

CONCLUSION. Our results show that CPAP/NIV is often implemented during the night, justifying the presence of a physiotherapist 24 h a day in our university hospital. Successful intervention is associated with a shorter length of ICU stay (Table 1)

TABLE 1 RESULTS

	CPAP ($n = 35$)	NIV ($n = 46$)
Number of treatments/patient	3.4	2.4
Duration of each treatment	89 ± 78 min	124 ± 174 min
% of CPAP/NIV at night (21H30–08H00)	24%	40%

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EFFECT OF AN EDUCATIONAL INTERVENTION ON THE TRACHEOBRONCHIAL ASPIRATION TECHNIQUE

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The tracheobronchial aspiration is a used technique in the Intensive Care Unit (ICU), with the purpose of removing secretions. Despite the existing recommendations worldwide for the tracheobronchial aspiration procedure to properly prevent hospital infections, many times they are not appropriately followed by health professionals. For this reason, educational programs for the medical team have been adopted as a measure to prevent of respiratory infections in ICU.

Evaluate the effectiveness of an educational intervention in the adhesion by health professionals, the technical recommendations for tracheobronchial aspiration in patients hospitalized in the ICU.

It is a quasi-experimental study with evaluation of pre and post theoretical educational intervention, using interactivity and practical educational intervention with demonstration of the aspiration technique steps to participants. The trainings were divided into: 2 h in the evening for the employees that work in the afternoon and at night B, and 2 h in the afternoon for the employees that work in the morning and at night A. The technical recommendations for the tracheobronchial aspiration were addressed in patients hospitalized in the ICU. At the end of the educational intervention, each employee received didactic material on the tracheobronchial aspiration technique. In order to evaluate the adhesion to the technical recommendations for the tracheobronchial aspiration, after the application of the educational intervention, the procedures observed pre and post intervention were compared. The results were presented as absolute values and percentages and comparisons were performed using the qui-square test with significance level of $p < 0.05$.

A low adhesion of health professionals regarding preventive measures was verified when observing 124 procedures. When comparing pre and post intervention, a significant increase in the adhesion in the following aspiration recommendations was verified: use of individual protection equipment (50% pre and 66.1% post, $p = 0.01$), care when opening the catheter package (67.7% pre and 96.8% post, $p < 0.001$), use of sterile gloves in the dominant hand for catheter removal (79.8% pre and 92.7% post, $p = 0.003$), contact of gloves with the catheter only (53.2% pre and 78.2% post, $p < 0.001$), execution of circular movements during catheter removal (14.5% pre and 45.2% post, $p < 0.001$), wrapping the catheter with the sterile gloves at the end of the procedure (63.7% pre and 80.6% post, $p = 0.003$), water tap to wash the connection latex in the beginning of the procedure (62.1% pre and 79.8% post, $p = 0.002$) and disposed of at the end (70.2% pre and 87.9% post, $p < 0.001$), execution of all aspiration technique procedures (0.8% pre and 14.5% post, $p < 0.001$).

The results of this study showed low adhesion of health professionals to preventive measures of hospital infection, indicating that the implementation of educational strategies is required.

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APPARATUS PROPOSAL OF A SIMPLE METHOD TO OBTAIN OPTIMAL CUFF PRESSURE IN THE CLASSIC LARYNGEAL MASK AIRWAY

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Laryngeal Mask Airways are often over-inflated by anaesthetists and operating department practitioners (ODPs), despite several papers advocating inflation of the cuff with volumes less than the manufacturer′s recommended maximum. It is in our best interest to review current practice not only because of the reported Laryngopharyngeal morbidity associated with high cuff pressures but also due to the potential legal implications that misuse of the laryngeal mask airway may have.

OBJECTIVE. To investigate whether the cuff pressure applied to the Laryngeal Mask Airway Classic follows manufacturers' recommendations and to review the effectiveness of a novel technique in reducing the intra-cuff pressure to within manufacturers recommendations.

DESIGN. Observational Cohort Study Setting - Anaesthetic rooms in the operating theatres at the Royal Bolton Hospital from May to July 2008

PARICIPANTS. 192 adult and paediatric patients undergoing general anaesthesia where the Laryngeal Mask Airway Classic was used as airway management.

MAIN OUTCOME MEASURE. Comparison of intra-cuff pressure after induction of anaesthesia before and after application of a 20 ml syringe.

RESULTS. 93% (179/192) of samples initially demonstrated intra-cuff pressures of greater than 60 cmH_2O and so failed to meet the manufacturers recommendations (30–60 cm H2O). In 122 of those samples, the pressure was grossly elevated to beyond 120 cmH_2O. The initial mean cuff pressure was 106.54 ± 21.10 cmH_2O. After initial passive removal of air with a 20 ml syringe the number of samples where the intra-cuff pressure met the manufacturers recommended limits increased to 73% (52/192), with the mean pressure being 59.60 ± 16.22 cmH_2O. Following a second passive removal of air only 3% (5/192) of samples sustained intracuff pressures that were outside the recommendations. The mean intracuff pressure had fallen to 51.2 $cmH_2O \pm 7.94$. After the third application of the syringe all 192 samples had an optimal intra-cuff pressure as recommended by the manufacturer. There was no significant difference between males or females, size of laryngeal mask or age with regard to intra-cuff pressures.

CONCLUSIONS. Considerably higher volumes of air are routinely being used to inflate the LMA than is deemed necessary by the manufacturer. It is possible that by applying a 20 ml syringe onto the pilot balloon of an overinflated cuff a more optimal pressure can be achieved. There is significant morbidity as a consequence of misuse of the LMA. All anaesthetists seem to be working outside the manufactures recommendations and therefore, theoretically, illegally. We can assume that this is both a national and international problem which needs addressing, whether in ICU, resuscitation or elective anaesthesia.

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AN ASSESSMENT OF THE INTERVEC™ ENDOTRACHEAL TUBE INTRODUCER AS ADJUNCT TO AIRWAY SCOPE™ IN A MANIKIN-SIMULATED DIFFICULT AIRWAY

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INTRODUCTION. The Airway Scope™ video laryngoscope provides an enhanced view of the glottis, and increases the likelihood of tracheal intubation compared with direct laryngoscopy in patients with a difficult airway. However, it has been well demonstrated that providing a good view of the glottis dose not always correlate with successful airway instrumentation. The limitation of the Airway Scope™ in advancing the endotracheal tube through the vocal cords into the trachea has been well described.

We evaluate the effectiveness of a new endotracheal tube introducer, INTERVEC™ as an adjunct to Airway Scope™ video laryngoscope in facilitating simulated difficult tracheal intubation in a manikin.

METHODS. In experienced laryngoscopists were recruited for this study. After brief training, participants were use the INTERVEC™ as an adjunct to Airway Scope™ for attempted tracheal intubation of a manikin-simulated difficult airway. Primary outcomes were successful endotracheal tube placement.

RESULTS. 10 study participants performed a total of 100 tracheal intubation for evaluation, and correct placement of the endotracheal tube was achieved in 10 (100%).

CONCLUSION. THE INTERVEC™ was effective adjunct to Airway Scope™ in facilitating tracheal intubation of a manikin-simulated difficult airway.